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"Wie das Geſtirn,
Ohne Haſt
Aber ohne Raſt,
Drehe ſich jeder
Um die eigene Laſt."

GOETHE.

TRANSACTIONS OF THE AMERICAN GYNECOLOGICAL SOCIETY

VOLUME 39

FOR THE YEAR 1914

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NOTE

The Society does not hold itself responsible for the views enunciated in the papers read at its meetings.

LE ROY BROUN, M.D., *Secretary*,
148 W. SEVENTY-SEVENTH STREET, NEW YORK.

OFFICERS AND FELLOWS

OF THE

AMERICAN GYNECOLOGICAL SOCIETY

1914

OFFICERS FOR 1914[1]

PRESIDENT

J. WHITRIDGE WILLIAMS, Baltimore.

VICE-PRESIDENTS

THOMAS J. WATKINS, Chicago.
HOWARD C. TAYLOR, New York.

SECRETARY

Le ROY BROUN, New York.

TREASURER

J. WESLEY BOVÉE, Washington.

OTHER MEMBERS OF THE COUNCIL

EDWARD P. DAVIS, Philadelphia.
[To serve one year.]

REUBEN PETERSON, Ann Arbor.
[To serve two years.]

HOWARD A. KELLY, Baltimore.
[To serve three years.]

HENRY C. COE, New York.
[To serve four years.]

WILLIAM E. STUDDIFORD, New York.
THOMAS S. CULLEN, Baltimore.
[To serve one year.]

[1] Officers for the ensuing year may be found in the minutes of the meeting, page xlvii.

LIST OF OFFICERS

FROM THE ORGANIZATION TO THE PRESENT TIME

* Deceased.

	President.	*Vice-Presidents.*	*Secretary.*	*Treasurer.*
1876.	*Fordyce Barker.	*Washington L. Atlee, *William H. Byford.	*James R. Chadwick.	*Paul F. Mundé.
1877.	*Fordyce Barker.	*Washington L. Atlee, *William H. Byford.	*James R. Chadwick.	*Paul F. Mundé.
1878.	*Edmund R. Peaslee.	*William Goodell, *Isaac E. Taylor.	*James R. Chadwick.	*Paul F. Mundé.
1879.	*T. Gaillard Thomas.	*D. Humphreys Storer, *Henry P. C. Wilson.	*James R. Chadwick.	*Paul F. Mundé.
1880.	*J. Marion Sims.	*W. T. Howard, *Robert Battey.	*James R. Chadwick.	*Paul F.Mundé.
1881.	*W. H. Byford.	*T. A. Reamy, *H. F. Campbell.	*James R. Chadwick.	*Paul F. Mundé.
1882.	Thomas Addis Emmet.	*George H. Lyman, *Emil Noeggerath.	*James R. Chadwick.	*Paul F. Mundé.
1883.	*Gilman Kimball.	*Albert H. Smith, *Theophilus Parvin.	Frank P. Foster.	*Paul F. Mundé.
1884.	*Albert H. Smith.	*James R. Chadwick, *Samuel C. Busey.	Frank P. Foster.	Matthew D. Mann.
1885.	*William T. Howard.	Wm. L. Richardson, *Paul F. Mundé.	Frank P. Foster.	Matthew D. Mann.
1886.	*Thaddeus A. Reamy.	*Theophilus Parvin, *Geo. J. Engelmann.	Joseph Taber Johnson.	Matthew D. Mann.
1887.	*Alex. J. C. Skene.	John C. Reeve, *Ellwood Wilson.	Joseph Taber Johnson.	Matthew D. Mann.
1888.	*Robert Battey.	*A. Reeves Jackson, *James R. Chadwick.	Joseph Taber Johnson.	Matthew D. Mann.
1889.	*Henry P. C. Wilson.	*William T. Lusk, *Edward W. Jenks.	Joseph Taber Johnson.	Matthew D. Mann.
1890.	John P. Reynolds.	William M. Polk, *Ely Van de Warker.	Joseph Taber Johnson.	Matthew D. Mann.
1891.	*A. Reeves Jackson.	Joseph Taber Johnson, William H. Baker.	Henry Clark Coe.	Matthew D. Mann.
1892.	*John Byrne.	Richard B. Maury, *Cornelius Kollock.	Henry Clark Coe.	Matthew D. Mann.

	President.	*Vice-Presidents.*	*Secretary.*	*Treasurer.*
1893.	*Theophilus Parvin.	William H. Parish, William H. Baker.	Henry Clark Coe.	Matthew D. Mann.
1894.	*William T. Lusk.	*Samuel C. Busey, Bache McE. Emmet.	Henry Clark Coe.	Matthew D. Mann.
1895.	Matthew D. Mann.	*Geo. J. Engelmann, Clement Cleveland.	Henry Clark Coe.	J. Montgomery Baldy.
1896.	William M. Polk.	*James H. Etheridge, *Fernand Henrotin.	Henry Clark Coe.	J. Montgomery Baldy.
1897.	*James R. Chadwick.	*R. Stansbury Sutton, Henry J. Garrigues.	J. Riddle Goffe.	J. Montgomery Baldy.
1898.	*Paul F. Mundé.	Emilius C. Dudley, *Arthur W. Johnstone.	J. Riddle Goffe.	J. Montgomery Baldy.
1899.	Joseph Taber Johnson.	Howard A. Kelly, A. F. A. King.	J. Riddle Goffe.	J. Montgomery Baldy.
1900.	*George J. Engelmann.	Edward L. Duer, Seth C. Gordon.	J. Riddle Goffe.	J. Montgomery Baldy.
1901.	*Ely Van de Warker.	Charles Jewett, Richard B. Maury.	J. Riddle Goffe.	J. Montgomery Baldy.
1902.	Seth C. Gordon.	*George M. Edebohls, Edward Reynolds.	J. Riddle Goffe.	J. Montgomery Baldy.
1903.	Joseph E. Janvrin.	*Edward W. Jenks, *A. Palmer Dudley.	J. Riddle Goffe.	J. Montgomery Baldy.
1904.	Edward Reynolds.	J. Whitridge Williams, Edward P. Davis.	J. Riddle Goffe.	J. Montgomery Baldy.
1905.	E. C. Dudley.	Henry D. Fry, Henry C. Coe.	J. Riddle Goffe.	J. Montgomery Baldy.
1906.	Richard B. Maury.	Howard A. Kelly, Reuben Peterson.	J. Riddle Goffe.	J. Montgomery Baldy.
1907.	Clement Cleveland.	Willis E. Ford, J. Clifton Edgar.	J. Riddle Goffe.	J. Montgomery Baldy.
1908.	J. Montgomery Baldy.	I. S. Stone, Eugene Boise.	J. Riddle Goffe.	Charles P. Noble.
1909.	J. Riddle Goffe.	Howard A. Kelly, Malcolm McLean.	Le Roy Broun.	J. Wesley Bovée.
1910.	Edward P. Davis.	Seth C. Gordon, Edward Reynolds.	Le Roy Broun.	J. Wesley Bovée.
1911.	Reuben Peterson.	John F. Thompson, John G. Clark.	Le Roy Broun.	J. Wesley Bovée.
1912.	Howard A. Kelly.	Richard R. Smith, John A. Sampson.	Le Roy Broun.	J. Wesley Bovée.
1913.	Henry C. Coe.	George H. Noble, George Gellhorn.	Le Roy Broun.	J. Wesley Bovée.
1914.	J. Whitridge Williams.	Thomas J. Watkins, Howard C. Taylor.	Le Roy Broun.	J. Wesley Bovée.

HONORARY FELLOWS

American

ELECTED

1914. THOMAS B. ASHBY, M.D., 1125 Madison Avenue, Baltimore, Maryland.

1914. B. F. BAER, M.D., 2115 Chestnut St., Philadelphia, Pa.

1910. WILLIAM H. BAKER, M.D., 22 Mount Vernon St., Boston, Mass.

1912. B. BERNARD BROWNE, M.D., 510 Park Ave., Baltimore.

1914. ANDREW F. CURRIER, M.D., 173 East Lincoln Ave., Mt. Vernon, N. Y.

1914. FRANCIS H. DAVENPORT, M.D., 419 Boylston St., Boston, Massachusetts.

1912. EDWARD L. DUER, M.D., 1006 Locust St., Philadelphia.

1912. BACHE McE. EMMET, M.D., 535 Park Ave., New York

1902. THOMAS ADDIS EMMET, M.D., 93 Madison Ave., N.Y. *Founder.*

1905. WILLIAM GARDNER, M.D., 109 Union Ave., Montreal, Canada.

1914. EUGENE C. GEHRUNG, 3857 Westminster Place, St. Louis, Missouri.

1909. MATTHEW D. MANN, M.D., 37 Allen St., Buffalo, N. Y.

1883. RICHARD B. MAURY, M.D., 111 Court St., Memphis, Tenn.

1907. CHAUNCEY D. PALMER, M.D., Avondale, Cincinnati, Ohio.

1897. JOHN C. REEVE, M.D., LL.D., Dayton, Ohio. *Founder.*

1903. WILLIAM L. RICHARDSON, M.D., 225 Commonwealth Ave., Boston. *Founder.*

Foreign

1878. J. AMÉDÉE DOLÉRIS, M.D., Paris, France.

1909. ALBAN HENRY GRIFFITHS DORAN, F.R.C.S. (England), 6 Palace Mansions, Addison Bridge, Kensington, London.

1899. D. BERRY HART, M.D., 5 Randolph Cliff, Edinburgh, Scotland.

1909. MAX HOFMEIER, M.D., Schoenleinster 4, Wurzburg, Germany.

1895. CHARLES JACOBS, M.D., 53 Boulevard de Waterloo, Brussels, Belgium.

1912. J. M. MUNRO KERR, M.D., 7 Clairmont Gardens, Glasgow, Scotland.

1888. AUGUST MARTIN, M.D., Greifswald, Germany, Wallenburth, 73.

1912. W. NAGEL, M.D., Potsdamerstr. 121h, Berlin W. 35, Germany.

1891. ROBERT OLSHAUSEN, M.D., N. Artillerie St., 19, Berlin, Germany.
1901. KARL PAWLIK, M.D., Spálená Ulice 3ª, Prague.
1891. S. POZZI, M.D., 47 Avenue d'Jena, Paris, France.
1888. Sir ALEXANDER R. SIMPSON, Kt., 52 Queen St., Edinburgh, Scotland.
1909. HERBERT R. SPENCER, M.D., 104 Harley St., W. London, Eng.
1901. TH. TUFFIER, M.D., 42 Avenue Gabriel, Paris, France.

Total, thirty Honorary Fellows.

HONORARY FELLOWS

DECEASED

ELECTED

1877. JOHN L. ATLEE, M.D., Lancaster, Pa.
1884. GEORGE GRANVILLE BANTOCK, M.D., London, England.
1876. ROBERT BARNES, M.D., London, England.
1892. ROBERT BATTEY, M.D., Rome, Georgia. *Founder.*
1878. JOHN S. BILLINGS, M.D., LL.D., New York.
1897. SAMUEL C. BUSEY, M.D., LL.D., Washington, D. C. *Founder.*
1910. J. CHALMERS CAMERON, M.D., Montreal, Canada.
1890. HENRY F. CAMPBELL, M.D., Augusta, Georgia. *Founder.*
1905. JAMES R. CHADWICK, A.M, M.D., Boston. *Founder.*
1889. M. CHARPENTIER, M.D., Paris, France.
1893. CHARLES J. CULLINGWORTH, M.D., London, England.
1877. JOHN C. DALTON, M.D., New York.
1877. J. A. H. DEPAUL, M.D., Paris, France.
1878. J. MATTHEWS DUNCAN, M.D., London, England.
1888. ALEXANDER DUNLAP, M.D., Springfield, Ohio.
1876. JOSEPH A. EVE, M.D., Augusta, Georgia.
1901. HENRY J. GARRIGUES, M.D., Tryon, North Carolina.
1889. ROBERT P. HARRIS, M.D., Philadelphia.
1888. GRAILY HEWITT, M.D., London, England.
1881. J. BRAXTON HICKS, M.D., London, England.
1902. WILLIAM T. HOWARD, M.D., Baltimore, Md. *Founder.*
1911. JOSEPH E. JANVRIN, M.D., New York.
1876. THOMAS KEITH, M.D., London, England.
1888. GILMAN KIMBALL, M.D., Lowell, Massachusetts.
1891. CHRISTIAN G. LEOPOLD, M.D., Dresden, Germany.
1876. ALFRED H. M'CLINTOCK, M.D., Dublin, Ireland.
1892. OTTAVIO MORISANI, M.D., Naples, Italy.
1888. EMIL NOEGGERATH, M.D., Wiesbaden, Germany. *Founder.*
1877. CHARLES PAJOT, M.D., Paris, France.
1908. J. PFANNENSTIEL, M.D., Kiel, Germany.
1885. W. S. PLAYFAIR, M.D., London, England.
1888. SIR WILLIAM O. PRIESTLEY, LL.D., London, England.
1907. THADDEUS A. REAMY, M.D., Cincinnati, Ohio.
1901. M. SAENGER, M.D., Prague.
1877. F. W. VON SCANZONI, M.D., Würzburg, Bavaria.

1896. PAUL SÉGOND, M.D., Paris, France.
1876. CARL SCHROEDER, M.D., Berlin, Germany.
1876. GUSTAV SIMON, M.D., Heidelberg, Germany.
1888. D. HUMPHREYS STORER, M.D., Boston. *Founder.*
1905. R. STANSBURY SUTTON, M.D., Pittsburgh, Pa.
1882. LAWSON TAIT, Esq., Birmingham, England.
1881. S. TARNIER, M.D., Paris, France.
1888. ISAAC E. TAYLOR, M.D., New York. *Founder.*
1893. T. GAILLARD THOMAS, M.D., New York. *Founder.*
1882. J. KNOWSLEY THORNTON, Esq., London, England.
1909. ELY VAN De WARKER, M.D., Syracuse, N.Y.
1886. Sir SPENCER WELLS, Bart., London, England.
1881. FRANZ VON WINCKEL, M.D., Munich, Germany.
1876. MARMADUKE B. WRIGHT, M.D., Cincinnati.

ACTIVE FELLOWS

1906.—Andrews, Frank T., A.M., M.D. Professor of Clinical Gynecology, Northwestern University Medical School; Gynecologist to Mercy and Wesley Hospitals and South Side Dispensary. 32 N. State Street, Chicago.

1909.—Anspach, Brooke M., M.D., F.A.C.S. Gynecologist and Obstetrician to the Philadelphia and the Stetson Hospitals; Associate in Gynecology, University of Pennsylvania; Assistant Gynecologist, University Hospital; Surgeon to the Gynecean Hospital. 119 South Twentieth Street, Philadelphia.

1888.—Ashby, Thomas A., M.D., LL.D., F.A.C.S. Professor of Diseases of Women, University of Maryland; Honorary Member of Medical Society, District of Columbia, Washington, D.C.; Ex-President of Medical and Chirurgical Faculty of Maryland. 1125 Madison Avenue, Baltimore, Maryland.

1895.—Ashton, William Easterly, M.D., Professor of Gynecology, Medico-Chirurgical College of Philadelphia; Gynecologist to Medico-Chirurgical and Philadelphia Hospitals; First Lieutenant in the Medical Reserve Corps of the United States Army. 2011 Walnut Street, Philadelphia.

1889.—Baldy, J. Montgomery, M.D., F.A.C.S. Professor of Gynecology, Philadelphia Polyclinic; Surgeon to the Gynecean Hospital; Consulting Surgeon to the Jewish and the Frederick Douglas Hospitals. *Treasurer*, 1894–1907. *President*, 1908. *Council*. 2219 De Lancey Place, Philadelphia.

1908.—Bissell, Dougal, M.D., F.A.C.S. Surgeon to the Woman's Hospital in the State of New York; Consulting Surgeon to the State Hospital (Insane), Central Islip, L. I. 219 W. Seventy-ninth Street, New York.

1896.—Boise, Eugene, A.B., M.D. Consulting Physician to Butterworth Hospital. Grand Rapids, Michigan.

1888.—Boldt, Hermann J., M.D., F.A.C.S. Consulting Gynecologist to the German Poliklinik; Consulting Gynecologist to the Beth Israel Hospital, and to the Philanthropic Hospital; Professor of Diseases of Women, New York Post-Graduate Medical School and Hospital; Fellow of the Royal Society of Medicine and International Gynecological Societies, and of the Southern Surgical and Gynecological Society; Consulting Gynecologist to St. Vincent's Hospital; Member of Gynecological Society of Germany; Gynecologist to Post-Graduate Hospital. 39 East Sixty-first Street, New York.

1897.—Bovée, J. Wesley, M.D., F.A.C.S. Professor of Gynecology, George Washington University; Gynecologist to Columbia and George Washington University Hospitals, and St. Elizabeth's Hospital for the Insane. *Treasurer.* The Rochambeau, 815 Connecticut Avenue, Washington, D. C.

1909.—Brettauer, Joseph, M.D. Attending Gynecologist to Mt. Sinai Hospital, New York; Consulting Gynecologist to New Jersey State Hospital, Greystone Park, N. J., and to the United Hospital, Portchester, N. Y. 1063 Madison Avenue, New York.

1913.—Brickner, Samuel M., A.M., M.D. Late Associate Attending Gynecologist to Mt. Sinai Hospital. Saranac Lake, New York.

1905.—Broun, Le Roy, B.S., M.D., F.A.C.S. Surgeon to Woman's Hospital in the State of New York; Surgeon to Manhattan State Hospital (Insane Asylum). *Secretary.* 148 West Seventy-seventh Street, New York.

1898.—Burrage, Walter L., A.M., M.D. Formerly Gynecologist to St. Elizabeth's and the Carney Hospitals. 282 Newbury Street, Boston, Massachusetts.

1889.—Byford, Henry T., M.D., F.A.C.S. Emeritus Professor Gynecology, University of Illinois. Peoples Gas Building, cor. Michigan Avenue and Adams St., Chicago.

1913.—Child, Charles Gardner, Jr., M.D. Professor of Gynecology in the New York Polyclinic; Consulting Gynecologist to Mt. Vernon Hospital and St. Faith's Home; Attending Gynecologist to City Hospital; Assistant Surgeon to Woman's Hospital. 163 East 71st Street, New York.

1903.—Chipman, Walter William, M.D., F.A.C.S., F.R.C.S. (Edin.). Professor of Obstetrics and Gynecology, McGill University; Gynecologist to the Royal Victoria Hospital;

Obstetric Physician to the Montreal Maternity Hospital, 285 Mountain Street, Montreal, Canada.

1903.—Clark, John G., M.D., F.A.C.S. Professor of Gynecology, University of Pennsylvania; Gynecologist-in-Chief, University Hospital; Consulting Gynecologist to the Jewish and Bryn Mawr, Germantown, Chestnut Hill, and other hospitals; Chairman Section Diseases of Women and Obstetrics, American Medical Association, 1910. *Vice-President*, 1911. 2017 Walnut Street, Philadelphia.

1889.—Cleveland, Clement, A.M., M.D., F.A.C.S. Surgeon to the Woman's Hospital in the State of New York; Consulting Gynecologist to General Memorial Hospital. *Council.* Office: 40 East Forty-first Street. Residence: 925 Park Ave., New York.

1888.—Coe, Henry C., A.M., M.D., M.R.C.S., F.A.C.S. Gynecologist to Bellevue Hospital; Consulting Gynecologist to the Woman's and New York Foundling Hospitals; Professor of Gynecology in the University and Bellevue Hospital Medical College; Honorary Fellow Edinburgh Obstetrical Society. *Secretary*, 1891–96. *Vice-President*, 1905. *President*, 1913. *Council.* 40 East 41st Street, New York.

1896.—Cragin, Edwin B., A.B., A.M. (Hon.), M.D., F.A.C.S. Professor of Obstetrics and of Gynecology, College of Physicians and Surgeons, New York; Attending Obstetrician and Gynecologist to the Sloane Hospital for Women; Consulting Gynecologist to the Presbyterian, the Roosevelt, and Lincoln Hospitals, to the New York Infirmary for Women and Children, and to St. Luke's Hospital, Newburg, N. Y.; Consulting Obstetrician to the City Maternity, Italian, New York Nursery, and Child's Hospitals. 10 West Fiftieth Street, New York.

1909.—Crossen, Harry Sturgeon, M.D., F.A.C.S. Associate Gynecologist to the Washington University Hospital and Associate in Gynecology, Washington Medical School; Gynecologist to St. Luke's, Mullanphy, and St. Louis Maternity Hospitals, and the Missouri Baptist Sanitarium. Metropolitan Building, St. Louis, Missouri.

1904.—Cullen, Thomas S., M.D., F.A.C.S. Associate Professor of Gynecology, Johns Hopkins University; Associate Gynecologist, Johns Hopkins Hospital; Consulting Gynecologist, Church Home and Infirmary. *Council*, 1914. 20 E. Eager St., Baltimore, Maryland.

1914.—Curtis, Arthur H., B.S., M.D., F.A.C.S. Adjunct Gynecologist, St. Luke's Hospital; Gynecologist, Annie Durand Hospital; Clinical Assistant in Gynecology, Northwestern Medical School. 76 East Monroe St., Chicago, Illinois.

1893.—Cushing, Ernest W., A.B., LL.D., M.D. Formerly Professor of Abdominal Surgery and Gynecology, Tufts College Medical School; Surgeon to Woman's Charity Club Hospital. 168 Newbury Street, Boston, Massachusetts.

1891.—Davis, Edward P., A.M., M.D., F.A.C.S. Professor of Obstetrics, Jefferson Medical College; Obstetrician to the Jefferson Hospital; Obstetrician and Gynecologist to Philadelphia Hospital; Consultant to the Preston Retreat; Member (Founder) International Congress of Obstetrics and Gynecology; Honorary Member of Chicago Gynecological Society; Academy of Surgery, Bucharest; Medical Society of Virginia; Member College of Physicians of Philadelphia; Philadelphia Obstetrical Society. *Council*, 1896–1899. *Vice-President*, 1904. *President*, 1910. *Council*. 250 South Twenty-first Street, Philadelphia.

1892.—Dickinson, Robert L., M.D., F.A.C.S. Senior Gynecologist and Obstetrician, Brooklyn Hospital; Consultant Obstetrician, Methodist Episcopal Hospital; Consultant Gynecologist, hospitals in Jamaica, Flushing, L. I., and Brattleboro, Vt. 168 Clinton Street, Brooklyn, New York.

1886.—Dudley, Emilius Clark, A.B., M.D., F.A.C.S. Professor of Gynecology, Northwestern University Medical School; Fellow of the Royal Society of Medicine. *Council*, 1891, 1893, 1906–1909. *Vice-President*, 1898. *President*, 1905. 122 South Michigan Avenue, Chicago.

1893.—Edgar, James Clifton, Ph.B., A.M., M.D., F.A.C.S. Professor of Obstetrics and Clinical Midwifery, Cornell University Medical College of New York; Attending Surgeon to the Manhattan Maternity Hospital; Attending Obstetrician to Bellevue Hospital. *Vice-President*, 1907. 18 West Fifty-sixth Street, New York.

1907.—Ehrensfest, Hugo, M.D. Professor of Obstetrics and Gynecology, St. Louis University; Physician-in-Chief, St. Louis Obstetric Dispensary; Obstetrician, Jewish Hospital; Visiting Gynecologist, St. Louis City Hospital. 4333 McPherson Avenue, St. Louis, Missouri.

1904.—Findley, Palmer, B.S., M.D., F.A.C.S. Professor of Gynecology, College of Medicine, University of Nebraska. *Council,* 1913. 3602 Lincoln Boulevard, Omaha, Nebraska.

1889.—Ford, Willis E., A.M., M.D. Chief-of-Staff and Gynecologist, St. Luke's Hospital. *Council,* 1893. *Vice-President,* 1907. 266 Genesee Street, Utica, New York.

1913.—Foulkrod, Collin, M.D. Lecturer on Obstetric Pathology and Assistant Demonstrator in Obstetrics, Jefferson Medical College; Obstetrician in the Presbyterian Hospital. 4005 Chestnut Street, Philadelphia.

1912.—Frank, Robert Tilden, B.A., M.A., M.D. Associate Gynecologist, Mount Sinai Hospital. 983 Park Avenue, New York.

1890.—Fry, Henry D., M.D., F.A.C.S. Professor of Obstetrics, Medical Department of Georgetown University; Obstetrician-in-Chief, Georgetown University Hospital. *Vice-President,* 1905. 1929 19th Street, N. W., Washington, D. C.

1904.—Gellhorn, George, M.D., F.A.C.S. Associate in Gynecology, Washington University; Gynecologist to St. Luke's Hospital and Barnard Free Skin and Cancer Hospital; Visiting Gynecologist to St. Louis City Hospital and Sanitarium; Assistant Gynecologist to Washington University Hospital; Consulting Obstetrician to St. Louis Maternity Hospital; Fellow of Deutsche Gesellschaft für Gynäkologie; Member of Gynecological Society of Berlin; Honorary Member of Chicago Gynecological Society. *Vice-President,* 1913. 713 Metropolitan Building, St. Louis, Missouri.

1891.—Goffe, J. Riddle, Ph.M., M.D., F.A.C.S. Fellow of the College of Surgeons of America; President of the Seventh International Congress for Obstetrics and Gynecology; Professor of Gynecology, New York Polyclinic Medical School and Hospital, and Dartmouth Medical College; Attending Surgeon to the Woman's Hospital in the State of New York; Consulting Gynecologist to New York City Hospital, to St. Joseph's Hospital, Yonkers, N. Y., to Mt. Vernon Hospital, Mt. Vernon, N. Y., and to the Lawrence Hospital, Bronxville. *Council,* 1896. *Secretary,* 1897–1908. *President,* 1909. *Council.* 171 West 71st Street, New York.

1911.—Goodall, James R., B.A., M.D., C.M., D.Sc. Assistant Professor of Gynecology and Lecturer on Obstetrics, McGill University; Assistant Gynecologist to the Royal Vic-

toria Hospital; Assistant Obstetric Physician to the Montreal Maternity Hospital; Surgeon-in-Chief to the Samaritan Hospital for Women; Consulting Gynecologist to the General Hospital, Saranac, N. Y., and Alice Hyde Hospital, Malone, N. Y. 27 Bishop Street, Montreal, Canada.

1888.—Gordon, Seth Chase, M.D., LL.D. Former Lecturer to the Portland School for Medical Instruction; Ex-Surgeon to the Maine General Hospital; Consulting Surgeon to the Maine Eye and Ear Infirmary and to the Maine General Hospital; Ex-President of the Main Medical Association; Ex-President, Section of Obstetrics and Gynecology, American Medical Association; Fellow of the Royal Society of Medicine; Fellow of the Boston Gynecological Society and of the Detroit Academy of Medicine; Ex-President Board of Trustees, Maine Insane Asylums and School for Feeble Minded. President Cumberland County Medical Society, 1910. *Council*, 1892, 1903–1907, and 1910. *President* 1902. 157 High Street, Portland, Maine.

1913.—Graves, William P., M.D., F.A.C.S. Surgeon-in-Chief to the Free Hospital for Women, Brookline; Professor of Gynecology, Harvard Medical School; Consulting Physician of Boston Lying-in Hospital. 224 Marlborough Street, Boston.

1886.—Green, Charles M., A.B., M.D. Professor of Obstetrics and Gynecology, Harvard University; Senior Surgeon for Diseases of Women, Boston City Hospital; Visiting Physician to the Boston Lying-in Hospital; Consulting Physician to the Adams Nervine Asylum, and to the State Hospital at Tewksbury; Ex-President of the Obstetrical Society of Boston, and of the Boston Society for Medical Improvement. *Council*, 1895, 1899. 78 Marlborough Street, Boston, Massachusetts.

1895.—Harris, Philander A., M.D., F.A.C.S. Gynecologist and Obstetrician to the Paterson General Hospital; Gynecologist to the Passaic General Hospital; Consulting Gynecologist to the Miriam Barnert Hospital and to the New Jersey State Hospital. Corresponding Member of the Obstetrical and Gynecological Society of Paris, France (1895); First Vice-President of the American Medical Association (1913); Fellow of the Society of Surgeons of New Jersey.. 26 Church Street, Paterson, N. J.

1894.—Harrison, George Tucker, M.A., M.D., F.A.C.S. Consulting Surgeon to Woman's Hospital; formerly Consulting Obstetrician to Nursery and Child's Hospital; formerly Consulting Gynecologist to the Misericordia Hospital; formerly Surgeon to St. Elizabeth's Hospital; Honorary Fellow, Medical Society of Virginia. *Council.* University of Virginia, Virginia.

1913.—Heaney, Noble Sproat, A.B., M.D., F.A.C.S. Assistant Professor of Obstetrics and Gynecology in Rush Medical College; Assistant Attending Obstetrician and Gynecologist to the Presbyterian Hospital. 122 South Michigan Avenue, Chicago, Illinois.

1891.—Hirst, Barton Cooke, M.D., F.A.C.S. Professor of Obstetrics, University of Pennsylvania; Gynecologist to the Howard and Orthopedic Hospitals; Consulting Obstetrician to the Lying-in Charity, Preston Retreat, and Newport Hospitals. 1821 Spruce Street, Philadelphia.

1913.—Huggins, Raleigh R., M.D., F.A.C.S. Gynecologist to St. Francis' Hospital; Associate Professor of Gynecology, University of Pittsburgh. 1018 Westinghouse Building, Pittsburgh, Pa.

1891.—Ingalls, Phineas H., A.M., M.D. Gynecologist, Hartford Hospital. 29 Pearl St., Room 509, Hartford, Conn.

1895.—Jarman, George W., A.M., M.D., F.A.C.S. Gynecologist to the General Memorial Hospital. 54 West Seventy-sixth Street, New York.

Founder.—Johnson, Joseph Taber, A.M., Ph.D., M.D., L.L.D., F.A.C.S. Emeritus Professor of Gynecology and Abdominal Surgery, University of Georgetown; formerly Gynecologist to the Providence and Columbia Hospitals; Chief of the Gynecological Service, Georgetown University Hospital; President, Southern Surgical and Gynecological Association, 1899; President of the Medical Society of the District of Columbia, 1887; Member of the British Medical Association; President of the Washington Obstetrical and Gynecological Society. *Secretary*, 1886–90. *Vice-President*, 1891. *Council*, 1881, 1885, 1897. *President*, 1899. 926 Farragut Square, Washington, D. C.

1887.—Kelly, Howard Atwood, B.A., M.D., LL.D., F.A.C.S. Professor of Gynecological Surgery, Johns Hopkins

University; Gynecologist to the Johns Hopkins Hospital; Honorary Fellow Royal College of Surgeons, Edinburgh; Honorary Member, Royal Medical Society of Edinburgh; Honorary Member, Italian Society of Obstetrics and Gynecology, Rome; Honorary Member, Society of Gynecology and Obstetrics, Berlin; Member of Society of Obstetrics, Leipzig; Honorary Fellow, Edinburgh Obstetrical Society; Honorary Fellow, Royal Academy of Medicine, Ireland; Honorary Fellow, Glasgow Obstetrical and Gynecological Society; Corresponding Member, Society of Obstetrics and Gynecology, Paris; Corresponding Member, Society of Surgery, Paris; Corresponding Member, Royal Society of Physicians, Vienna; Fellow, British Gynecological Society; Member, French Urological Association, Paris; Honorary Member, Society of Gynecology and Obstetrics, Belgium. *Vice-President*, 1899 and 1906. *President*, 1912. *Council*. 1418 Eutaw Place, Baltimore, Md.

1886.—King, Albert F. A., A.M., M.D., LL.D. Professor of Obstetrics in the Medical Department of the George Washington University, and in the University of Vermont; Obstetrician-in-Chief to the George Washington University Hospital; Consulting Physician to the Children's Hospital, Washington; Member of the Royal Society of Medicine; President of the Washington Obstetrical and Gynecological Society (1885–87). *Council*, 1898. *Vice-President*, 1899. 1315 Massachusetts Avenue, N. W., Washington, D. C.

1892.—Kirkley, Cyrus A., M.D., F.A.C.S. Toledo, Ohio.

1891.—Krug, Florian, M.D. Gynecologist to the Mt. Sinai Hospital; Consulting Gynecologist to the German Hospital. 616 Madison Avenue, New York.

1913.—Little, Herbert M., M.D., F.A.C.S. Assistant Professor of Obstetrics and Lecturer on Gynecology, McGill University; Assistant Accoucheur, Montreal Maternity Hospital; Assistant Gynecologist, Montreal General Hospital; Assistant Surgeon to the Samaritan Hospital of Montreal. 161 Stanley Street, Montreal, Canada.

1913.—McGlinn, John A., M.D. Assistant Professor of Obstetrics, Medico-Chirurgical College; Assistant Obstetrician, Medico-Chirurgical Hospital; Gynecologist to St. Agnes' Hospital; Obstetrician to St. Vincent's Maternity Hospital. 113 South 20th Street, Philadelphia, Pa.

1892.—McLean, Malcolm, M.D. Surgeon to St. Andrew's Infirmary for Women; Consulting Gynecologist to Randall's Island Hospitals; Associate Surgeon to the Woman's Hospital. *Vice-President,* 1908–09. 29 East One Hundred and Twenty-sixth Street, New York.

1901.—Manton, Walter Porter, M.D., F.A.C.S. Professor of Obstetrics and Clinical Gynecology, Detroit College of Medicine and Surgery; Gynecologist to Harper Hospital and to the Eastern and Northern Michigan Asylums for the Insane; Consulting Gynecologist to St. Joseph's Retreat; Visiting Obstetrician and President of Medical Board, Woman's Hospital and Infants' Home; President, Wayne County Medical Society, 1908–09; Chairman, Section of Obstetrics and Diseases of Women, American Medical Association, 1908–09; Fellow of the Royal Society of Medicine. 32 Adams Avenue, Detroit, Michigan.

1908.—Martin, Franklin H., M.D., F.A.C.S. Professor of Gynecology Post-Graduate Medical School of Chicago; General Secretary Clinical Congress of Surgeons of North America; Editor *Surgery, Gynecology, and Obstetrics;* General Secretary of the American College of Surgeons. 30 North Michigan Avenue, Chicago.

1909.—Miller, Gideon Brown, B.Sc., M.D., F.A.C.S. Attending Gynecologist to the Emergency Hospital and to the Garfield Hospital; Associate Gynecologist to the Columbia Hospital; Clinical Professor of Gynecology in the George Washington University. 1730 K Street, N. W., Washington, D. C.

1894.—Montgomery, Edward E., A.M., M.D., LL.D., F.A.C.S. Professor of Gynecology, Jefferson Medical College; Gynecologist to Jefferson Medical College and to St. Joseph's Hospitals. 1426 Spruce Street, Philadelphia.

1912.—Morley, William Horace, Ph.B., M.D., F.A.C.S. Director of Obstetrics, Detroit General Hospital; Visiting Obstetrician to the House of Providence Hospital; Assistant Visiting Obstetrician to the Woman's Hospital and Infants' Home. Addison Apts., Detroit, Michigan.

1891.—Mosely, William E., M.D., F.A.C.S. Professor Emeritus of Diseases of Women, Baltimore Medical College; Gynecologist to the Maryland General Hospital. *Council,* 1897. 301 W. Monument St., Baltimore, Maryland.

1904.—Newell, Franklin Spilman, A.B., M.D., F.A.C.S. Obstetrician to Massachusetts General Hospital; Assistant Visiting Physician, Boston Lying-in Hospital; Visiting Surgeon, Department of Diseases of Women, Boston City Hospital; Assistant Professor of Obstetrics and Gynecology, Harvard University. *Council.* 443 Beacon Street, Boston, Mass.

1894.—Newman, Henry Parker, A.M., M.D., F.A.C.S. Professor Emeritus of Gynecology, College of Physicians and Surgeons, Illinois University, Chicago, and in the Chicago Polyclinic Medical School and Hospital. Formerly President Chicago Post-Graduate Medical School and of Section on Obstetrics and Gynecology of American Medical Association. Founder and President of Marion Sims' Hospital, Chicago, 1895–1908; United States Secretary of Section on Abdominal Surgery and Gynecology, Pan-American Congress, 1901–05; Founder of the Congrés Periodique International de Gynécologie et d'Obstétrique; Attending Surgeon and Gynecologist, Agnew Hospital. San Diego, California.

1891.—Noble, Charles P., M.D., Sc.D. *Council,* 1899. *Treasurer,* 1908. Boise, Idaho.

1902.—Noble, George Henry, M.D., F.A.C.S. Gynecologist to Grady Hospital; Professor of Gynecology and Clinical Gynecology, Atlanta Medical College. *Vice-President,* 1913. 186 South Pryor Street. Residence, 980 Peachtree Street, Atlanta, Georgia.

1893.—Norris, Richard C., A.M., M.D. Assistant Professor of Obstetrics, Medical Department, University of Pennsylvania; Surgeon-in-Charge, Preston Retreat; Gynecologist to the Methodist Episcopal Hospital and to the Philadelphia Hospital. 500 North Twentieth St., Philadelphia.

1914.—Norris, Charles C., M.D. Instructor in Gynecology, University of Pennsylvania; Assistant Gynecologist to the Hospital, University of Pennsylvania; Physician to the Philadelphia Maternity Hospital. 1503 Locust Street, Philadelphia, Pa.

1897.—Peterson, Reuben, A.B., M.D., F.A.C.S. Professor of Obstetrics and Gynecology, University of Michigan; Obstetrician and Gynecologist to the University of Michigan Hospital; Medical Director, University Hospital. *Vice-President,* 1906. *President,* 1911. Ann Arbor, Michigan.

1908.—Polak, John Osborne, M.D., F.A.C.S. Professor of Obstetrics, Dartmouth Medical College; Professor of Obstetrics and Gynecology, Long Island College Hospital; Obstetrician and Gynecologist to the College Hospital; Consulting Obstetrician to the Methodist Episcopal Hospital; Gynecologist to the Jewish Hospital; Consulting Gynecologist to the Bushwick, Coney Island, Williamsburg, Deaconess', and People's Hospitals; Consulting Obstetrician to Mary Hitchcock Hospital, Hanover, New Hampshire. 287 Clinton Ave., Brooklyn, N. Y.

1881.—Polk, William Mecklenburg, M.D., LL.D., F.A.C.S. (Columbia and LL.D. University of the South Sewanee and University of Georgia). Dean of Cornell University Medical College; Professor of Gynecology, Cornell University Medical School; Gynecologist to Bellevue Hospital; Consulting Gynecologist to St. Luke's and St. Vincent's Hospitals, to the New York Lying-in Hospital, and to the New York Infirmary for Women and Children; President New York Academy of Medicine, 1910–14; President New York Obstetrical Society, 1884; Southern Surgical and Gynecological Association; Société Obstétricale et Gynécologie, Paris, France; Royal Society of Medicine, England; Société Belge de Gynécologie et Obstétrique, Brussells; Congrés Periodique Int. de Gynécologie et Obstétrique et de Pédiatrie, Founder; The Continental Anglo-American Medical Society of Paris, Vice-President; American Association Advancement of Science; Société Int. de Chirurgie. *Vice-President*, 1890. *Council*, 1891. *President*, 1896. 310 Fifth Avenue, New York.

1890.—Reynolds, Edward, M.D., F.A.C.S. *Council*, 1894–96, 1905–08. *Vice-President*, 1902 and 1910. *President*, 1904. 321 Dartmouth Street, Boston, Massachusetts.

1896.—Robb, Hunter, M.D. Professor of Gynecology, Western Reserve University; Visiting Gynecologist to the Lakeside Hospital. 702 Rose Building, Cleveland, Ohio.

1906.—Sampson, John A., M.D. Professor of Gynecology, Albany Medical College; Gynecologist to the Albany Hospital and South End Dispensary. *Council*, 1911. *Vice-President*, 1912. 180 Washington Avenue, Albany, New York.

1911.—Schenck, Benjamin R., A.B., M.D., F.A.C.S. Attending Gynecologist to Harper Hospital; Consulting

Obstetrician to the Woman's Hospital; Associate Professor of Gynecology, Detroit College of Medicine and Surgery. David Whitney Building, Detroit, Michigan.

1914.—Schumann, Edward A., A.B., M.D. Consulting Gynecologist Rush Hospital for Tuberculosis; Lieutenant, Medical Reserve Corps, U. S. Navy. 348 South 15th St., Philadelphia, Penna.

1907.—Simpson, Frank Farrow, A.B., M.D., F.A.C.S. Gynecologist, Allegheny General Hospital; Secretary-General of the Seventh International Congress for Obstetrics and Gynecology. 7048 Jenkins Arcade Building, Pittsburgh, Pa.

1914.—Slemons, Josiah Morris, A.B., M.D. Professor of Obstetrics and Gynecology, University of California; Director of "The Woman's Clinic," University of California Hospital. 3404 Clay Street, San Francisco, California.

1905.—Smith, Richard R., M.D., F.A.C.S. Surgeon to Butterworth Hospital. *Council*, 1911. *Vice-President*, 1912. Grand Rapids, Michigan.

1898.—Stone, Isaac S., M.D., F.A.C.S. Professor of Gynecology, University of Georgetown; Gynecologist to Columbia Hospital for Women, and to the Georgetown University Hospital; Fellow of the Royal Society of Medicine, London, England; President, Washington Obstetrical and Gynecological Society, 1907–09. *Vice-President*, 1908. Connecticut Avenue and L Street, N. W., Washington, D. C.

1905.—Stone, William Stephen, A.B., M.D. 113 East Sixty-second Street, New York.

1909.—Studdiford, William Emery, B.A., M.A., M.D., F.A.C.S. Assistant Professor of Gynecology, New York University; Assistant Gynecologist to Bellevue Hospital; Attending Obstetrician to the New York Nursery and Child's Hospital; Consulting Surgeon to the Franklin Hospital, New Jersey. *Council*, 1914. 124 East Thirty-sixth Street, New York.

1906.—Taussig, Frederick Joseph, A.B., M.D., F.A.C.S. Associate in Gynecology, Washington University; Gynecologist to Barnard Free Skin and Cancer Hospitals; Obstetrician to St. Louis Maternity Hospital; Gynecologist to the St. Louis City Hospital and City Sanitarium. 731 Metropolitan Building, St. Louis, Missouri.

1898.—Thompson, John F., A.M., M.D., F.A.C.S. Professor of Diseases of Women, Medical School of Maine (Bow-

doin); Surgeon, Maine General Hospital; Consulting Gynecologist, Webber Hospital, Biddeford. *Vice-President,* 1911. 211 State Street, Portland, Maine.

1905.—Taylor, Howard C., Ph.B., M.D., F.A.C.S. Attending Gynecologist, Roosevelt Hospital; Professor of Clinical Gynecology, Columbia University; Consulting Gynecologist, Tarrytown and Stamford Hospitals, Greenwich (Conn.) Hospital. *Vice-President,* 1914. 32 West Fiftieth St., New York.

1897.—Vineberg, Hiram N., M.D., F.A.C.S. Associate Gynecologist to Mt. Sinai Hospital; Visiting Gynecologist to Har Moriah Hospital; Consulting Gynecologist to the Montefiore Home for Chronic Invalids. 751 Madison Avenue, New York.

1903.—Wakefield, W. Francis B., M.D., F.A.C.S. 1525 Sutter Street, San Francisco, Cal.

1909.—Ward, George Gray, Jr., M.D., F.A.C.S. Professor of Diseases of Women and Gynecologist to the New York Post-Graduate Medical School and Hospital; Consulting Gynecologist to the Monmouth Memorial Hospital, Long Branch, New Jersey, and to the Italian Hospital, New York; Associate Surgeon to the Woman's Hospital; Lecturer in Gynecology, Cornell Medical College. *Council,* 1913. 71 West Fiftieth Street, New York.

1896.—Watkins, Thomas J., M.D., F.A.C.S. Professor of Clinical Gynecology, Northwestern University Medical School; Gynecologist to St. Luke's Hospital, Chicago. *Vice-President,* 1914. 104 S. Michigan Boulevard, Chicago.

1898.—Webster, J. Clarence, B.A., M.D. (Edin.), F.R.C.P.E., F.R.S.E., F.A.C.S. Professor of Obstetrics and Gynecology, Rush Medical College, University of Chicago; Gynecologist, Presbyterian and St. Joseph's Hospitals; Fellow of the Edinburgh Obstetrical Society; Corresponding Member of the Royal Academy of Palermo, Italy, and of the Italian Obstetrical and Gynecological Society. 920 Monroe Street, 104 South Michigan Boulevard, Chicago, Ill.

1902.—Wells, Brooks H., M.D., F.A.C.S. Professor of Gynecology in the New York Polyclinic Medical School and Hospital; Consulting Surgeon to the Brattleboro Memorial Hospital, Brattleboro, Vt.; Consulting Gynecologist to the Beth Israel Hospital, New York; Associate Surgeon to the Woman's Hospital in the State of New York. 523 Madison Avenue, New York.

1892.—Williams, J. Whitridge, A.B., M.D., Sc.D., F.A.C.S. Professor of Obstetrics, and Dean of Medical Department of Johns Hopkins University; Obstetrician-in-Chief to the Johns Hopkins Hospital; Honorary President, Glasgow Gynecological and Obstetrical Society, 1910–12; Corresponding Member of the Gynecological Societies of Leipzig and Munich. Honorary Fellow of Edinburgh Obstetrical Society, etc. *Council*, 1899. *Vice-President*, 1904. *President*, 1914. 1128 Cathedral St., Baltimore, Md.

1886.—Wylie, W. Gill, M.D. Professor Emeritus of Gynecology, New York Polyclinic Medical School and Hospital; Consulting Gynecologist to Bellevue Hospital; Fellow of the Royal Medical Society, England. 28 West Fortieth Street, New York.

Total, 92 Active Fellows.

ACTIVE FELLOWS

CLASSIFIED

Canada

Chipman, Walter William, 285 Mountain Street, Montreal.
Goodall, James R., 27 Bishop Street, Montreal.
Little, Herbert M., 161 Stanley Street, Montreal.

Connecticut

Ingalls, Phineas, 49 Pearl Street, Room 509, Hartford.

California

Newman, Henry Parker, San Diego.
Slemons, Josiah Morris, 3404 Clay St., San Francisco.
Wakefield, W. Francis, 1525 Sutter Street, San Francisco.

District of Columbia

Bovée, J. Wesley, The Rochambeau, 815 Connecticut Ave., Washington.
Fry, Henry D., 1929 Nineteenth Street, N. W., Washington.
Johnson, Joseph Taber, 926 Farragut Square, Washington.
King, Albert F. A., 1315 Massachusetts Avenue, N. W., Washington.
Miller, Gideon Brown, 1730 K Street, N. W., Washington.
Stone, Isaac S., Connecticut Avenue and L Street, N. W., Washington.

Georgia

Noble, George Henry, 980 Peachtree Street, Atlanta.

Idaho

Noble, Charles, P., Boise.

Illinois

Andrews, Frank T., 32 N. State Street, Chicago.
Byford, Henry T., Michigan Avenue and Adams Street, Chicago.
Curtis, Arthur H., 76 East Monroe Street, Chicago.
Dudley, Emilius Clark, 122 South Michigan Avenue, Chicago.
Heaney, Noble Sproat, 122 South Michigan Avenue, Chicago.
Martin, Franklin H., 20 North Michigan Avenue, Chicago.
Watkins, Thomas J., 104 S. Michigan Boulevard, Chicago.
Webster, J. Clarence, 920 Monroe Building, 104 South Michigan Avenue, Chicago.

KENTUCKY

WATHEN, WILLIAM H., The Gaulbert, Louisville.

MAINE

GORDON, SETH CHASE, 157 High Street, Portland.
THOMPSON, JOHN F., 211 State Street, Portland.

MARYLAND

ASHBY, THOMAS A., 1125 Madison Avenue, Baltimore.
CULLEN, THOMAS S., 20 East Eager Street, Baltimore.
KELLY, HOWARD A., 1418 Eutaw Place, Baltimore.
MOSELEY, WILLIAM E., 301 West Monument Street, Baltimore.
WILLIAMS, J. WHITRIDGE, 1128 Cathedral Street, Baltimore.

MASSACHUSETTS

BURRAGE, WALTER L., 282 Newbury Street, Boston.
CUSHING, ERNEST W., 168 Newbury Street, Boston.
DAVENPORT, FRANCIS H., 419 Boyleston Street, Boston.
GRAVES, WILLIAM P., 244 Marlborough Street, Boston.
GREEN, CHARLES M., 78 Marlborough Street, Boston.
NEWELL, FRANKLIN SPILMAN, 443 Beacon Street, Boston.
REYNOLDS, EDWARD, 321 Dartmouth Street, Boston.

MICHIGAN

BOISE, EUGENE, Grand Rapids.
MANTON, WALTER PORTER, 32 Adams Avenue, Detroit.
MORLEY, WILLIAM HORACE, 202 Fine Arts Building, Detroit.
PETERSON, REUBEN, Ann Arbor.
SCHENCK, BENJAMIN R., David Whitney Building, Detroit.
SMITH, RICHARD R., Grand Rapids.

MISSOURI

CROSSEN, HARRY STURGEON, Metropolitan Building, St. Louis.
EHRENFEST, HUGO, 4333 McPherson Avenue, St. Louis.
GELLHORN, GEORGE, 715 Metropolitan Building, St. Louis.
TAUSSIG, FREDERICK JOSEPH, 713 Metropolitan Building, St. Louis

NEBRASKA

FINDLEY, PALMER, 3602 Lincoln Boulevard, Omaha

NEW JERSEY

HARRIS, PHILANDER A., 26 Church Street, Paterson.

NEW YORK

BISSELL, DOUGAL, 219 West Seventy-ninth Street, New York.
BOLDT, HERMANN, J., 39 East Sixty-first Street, New York.
BRETTAUER, JOSEPH, 1063 Madison Avenue, New York.
BRICKNER, SAMUEL M., Saranac Lake, New York.
BROUN, LE ROY, 148 West Seventy-seventh Street, New York.

Child, Charles Gardner, 163 East Seventy-first Street, New York.
Cleveland, Clement, 40 East Forty-first Street, New York.
Coe, Henry C., 8 West Seventy-sixth Street, New York.
Cragin, Edwin B., 10 West Fiftieth Street, New York.
Dickinson, Robert L., 168 Clinton Street, Brooklyn.
Edgar, James Clifton, 28 West Fifty-sixth Street, New York.
Ford, Willis E., 266 Genesee Street, Utica.
Frank, Robert Tilden, 983 Park Avenue, New York.
Goffe, J. Riddle, 171 West 71st Street, New York.
Jarman, George W., 54 West Seventy-sixth Street, New York.
Krug, Florian, 616 Madison Avenue, New York.
McLean, Malcolm, 29 East 126th Street, New York.
Polak, John Osborne, 287 Clinton Avenue, Brooklyn.
Polk, William M., 310 Fifth Avenue, New York.
Sampson, John A., 180 Washington Avenue, Albany.
Schumann, Edward A., 348 S. 15th Street, Philadelphia.
Stone, William Stephen, 113 E. Sixty-second Street, New York.
Studdiford, William Emery, 124 East Thirty-sixth Street, New York.
Taylor, Howard C., 32 West Fiftieth Street, New York.
Vineberg, Hiram N., 751 Madison Avenue, New York.
Ward, George Gray, Jr., 71 West Fiftieth Street, New York.
Wells, Brooks H., 523 Madison Avenue, New York.
Wylie, W. Gill, 28 West Fortieth Street, New York.

Ohio

Kirkley, Cyrus A., Toledo.
Robb, Hunter, 702 Rose Building, Cleveland.

Pennsylvania

Anspach, Brooke M., 119 South Twentieth Street, Philadelphia.
Ashton, William Easterly, 2011 Walnut Street, Philadelphia.
Baer, B. F., 2115 Chestnut Street, Philadelphia.
Baldy, J. Montgomery, 2219 De Lancey Place, Philadelphia.
Clark, John G., 2017 Walnut Street, Philadelphia.
Davis, Edward P., 250 South Twenty-first Street, Philadelphia.
Foulkrod, Collin, 4005 Chestnut Street, Philadelphia.
Hirst, Barton Cooke, 1821 Spruce Street, Philadelphia.
Huggins, Raliegh R., 1018 Westinghouse Building, Pittsburgh.
McGlinn, John A., 113 South Twentieth Street, Philadelphia.
Montgomery, Edward E., 1426 Spruce Street, Philadelphia.
Norris, Charles C., 1503 Locust Street, Philadelphia.
Norris, Richard C., 500 North Twentieth Street, Philadelphia.
Simpson, Frank Farrow, 7048 Jenkins Arcade Building, Pittsburgh.

Virginia

Harrison, George Tucker, University of Virginia.

ACTIVE FELLOWS

DECEASED

† Made Honorary Fellow

Elected		Died
Founder.	ATLEE, WASHINGTON L., M.D.	1877
Founder.	BARKER, FORDYCE, M.D., LL.D.	1891
Founder.	†BATTEY, ROBERT, M.D.	1894
Founder.	BUCKINGHAM, CHARLES E., M.D.	1877
Founder.	†BUSEY, SAMUEL C., M.D., LL.D.	1901
Founder.	BYFORD, WILLIAM H., M.D., LL.D.	1890
Founder.	BYRNE, JOHN, M.D., M.R.C.S.E.	1902
Founder.	†CAMPBELL, HENRY F., M.D.	1891
Founder.	†CHADWICK, JAMES R., A.M., M.D.	1905
1888.	COLEMAN, JOHN SCOTT, M.D.	1892
Founder.	DRYSDALE, THOMAS M., A.M., M.D.	1904
1889.	DUDLEY, A. PALMER, M.D.	1905
1891.	EDEBOHLS, GEORGE M., A.M., M.D.	1908
Founder.	ENGELMANN, GEORGE J., A.M., M.D.	1903
1890.	ETHERIDGE, JAMES H., A.M., M.D.	1899
1902.	FREDERICK, CARLTON C., B.S., M.D.	1911
1909.	GARCEAU, EDGAR, M.D.	1913
Founder.	GOODELL, WILLIAM, A.M., M.D., LL.D.	1895
1887.	HANKS, HORACE TRACY, M.D., LL.D.	1900
1894.	HENROTIN, FERNAND, M.D.	1906
1892.	HOLMES, HORATIO R., M.D.	1896
Founder.	†HOWARD, WILLIAM T., M.D.	1907
1885.	HUNTER, JAMES B., M.D.	1889
1877.	JACKSON, A. REEVES, A.M., M.D.	1892
1889.	JAGGARD, W. W., M.D.	1896
1886.	†JANVRIN, JOSEPH E., M.D.,	1912
Founder.	JENKS, EDWARD W., M.D., LL.D.	1903
1885.	JEWETT, CHARLES, A.M., M.D., Sc.D.	1911
1886.	JOHNSTONE, ARTHUR W., A.M., M.D.	1905
1892.	KEATING, JOHN M., M.D., LL.D.	1893
1888.	KOLLOCK, CORNELIUS, A.M., M.D.	1897
1881.	LEE, CHARLES C., A.M., M.D., LL.D.	1893
Founder.	LUSK, WILLIAM T., A.M., M.D., LL.D.	1897

Elected		Died
Founder.	LYMAN, GEORGE H., M.D.	1891
1892.	MacMONAGLE, BEVERLY, M.D.	1912
Founder.	MUNDÉ, PAUL F., M.D., LL.D.	1902
1890.	MURRAY, ROBERT A., M.D.	1909
Founder.	†NOEGGERATH, EMIL, M.D.	1895
Founder.	PARVIN, THEOPHILUS, M.D., LL.D.	1898
Founder.	PEASLEY, E. RANDOLPH, M.D., LL.D.	1880
1892.	PRYOR, WILLIAM R., M.D.	1904
1877.	†REAMY, THADDEUS A., M.D., LL.D.	1909
1887.	REYNOLDS, JOHN P., M.D.	1896
1879.	SCOTT, JOHN, M.D., M.R.C.S.I.	1886
Founder.	SIMS, J. MARION, M.D., LL.D.	1883
Founder.	SKENE, ALEXANDER J. C., M.D.	1900
Founder.	SMITH, ALBERT H., M.D.	1886
Founder.	†STORER, D. HUMPHREYS, M.D.	1903
1891.	STRONG, CHARLES P., A.B., M.D.	1893
1879.	†SUTTON, R. STRANSBURY, M.D., LL.D.	1906
Founder.	†TAYLOR, ISAAC E., M.D.	1890
Founder.	†THOMAS, T. GAILLARD, M.D.	1903
Founder.	TRASK, JAMES D., M.D.	1883
Founder.	†Van de WARKER, ELY, M.D.	1911
1891.	WATHEN, WILLIAM H., M.D.	1913
Founder.	WALLACE, ELLERSLIE, M.D.	1885
Founder.	WHITE, JAMES P., M.D.	1881
1887.	WILSON, ELWOOD, M.D.	1889
Founder.	WILSON, HENRY P. C., M.D.	1898

MINUTES OF THE PROCEEDINGS

AT THE

THIRTY-NINTH ANNUAL MEETING

OF THE

AMERICAN GYNECOLOGICAL SOCIETY

HELD AT

BOSTON, MASSACHUSETTS

MAY 19, 20, AND 21, 1914

THIRTY-NINTH ANNUAL MEETING

BOSTON, MASSACHUSETTS, *May* 19, 20, 21, 1914.

The following members were present:

ANDREWS, FRANK T.
BISSELL, DOUGAL
BOLDT, HERMAN J.
BOVÉE, J. WESLEY
BRETTAUER, JOSEPH
BROUN, LE ROY
BYFORD, HENRY T.
CLARK, JOHN G.
CLEVELAND, CLEMENT
CRAGIN, EDWIN B.
CUSHING, ERNEST W.
DAVENPORT, FRANCIS H.
DAVIS, ERWARD P.
DICKINSON, ROBERT L.
DUDLEY EMILIUS CLARK
EHRENFEST, HUGO
FINDLEY, PALMER
FOULKROD, COLLIN
FRANK, ROBERT TILDEN
GELLHORN, GEORGE
GOODALL, JAMES R.
GORDON, SETH CHASE
GRAVES, WILLIAM P.
GREEN, CHARLES M.
HARRIS, PHILANDER A.
HARRISON, GEORGE TUCKER
HEANEY, NOBLE SPROAT
HIRST, BARTON COOKE
INGALLS, PHINEAS H.
JOHNSON, JOSEPH TABOR
KING, ALBERT F. A.
KRUG, FLORIAN
MCGLINN, JOHN A.
MARTIN, FRANKLIN H.
MORLEY, WILLIAM HORACE
NEWELL, FRANKLIN SPILMAN
NOBLE, GEORGE HENRY
PETERSON, REUBEN
POLAK, JOHN OSBORNE
REYNOLDS, EDWARD
SAMPSON, JOHN A.
SCHENCK, BENJAMIN R.
SIMPSON, FRANK FARROW
SMITH, RICHARD R.
STONE, ISAAC S.
STONE, WILLIAM STEPHEN
STUDDIFORD, WILLIAM EMERY
TAUSSIG, FREDERICK JOSEPH
TAYLOR, HOWARD C.
THOMPSON, JOHN F.
WATKINS, THOMAS J.
WEBSTER, J. CLARENCE
WELLS, BROOKS H.
WILLIAMS, J. WHITRIDGE

FIRST DAY.—*Tuesday, May* 19, 1914.

Morning Session.—The Society met at the Boston Medical Library, and was called to order by the President, Dr. J. Whitridge Williams, of Baltimore, at 10 A.M.

The Secretary called the roll.

Dr. Francis H. Davenport, of Boston, delivered the following

ADDRESS OF WELCOME

MR. PRESIDENT AND FELLOW MEMBERS OF THE AMERICAN GYNECOLOGICAL SOCIETY: It has fallen to my lot to have the pleasure of welcoming you again to our city. I see that it is ten years since the last time we met here, and that is a longer interval than usual. During that time many new members have been added to our ranks whom we are welcoming today for the first time. To the older members the memories of other gatherings here, associated with recollections of distinguished Fellows who have passed beyond, will predispose them to believe that we will do our best to make them enjoy their stay. To the younger Fellows we can only say that we hope they will look back upon this meeting when it is over with pleasure.

The efficient committee of the Boston Fellows has arranged what I hope will prove an agreeable program as far as the social side is concerned. There is one innovation which I think will be appreciated by you. Tomorrow we will spend the day at the Country Club, and see one of our charming rural spots. Those of you who can resist the attractions of golf and tennis will attend the usual morning and afternoon sessions, but the intervals can be devoted to the outdoor charms. The committee, I am informed, has arranged everything satisfactorily, even to the weather.

They have also arranged that the Fellows will be put up as guests of the Harvard Club, and that will form, I am sure, a good rallying point.

The members of the Obstetrical Society of Boston, who have always in the past extended you a hearty welcome, are this year to give you a luncheon. The thoughts of many of us older Fellows go back to the earlier days of the Society when such

national gatherings were fewer. The Society was smaller, and possibly for that reason the members enjoyed a little more intimate knowledge of each other. But there has always been a very strong feeling of good fellowship and hospitality in this Society, and I hope the organization will never grow so large that the personal element of mutual acquaintance and esteem will ever be lost, or that the numerous annual gatherings of the profession in its various ramifications will lead the members to neglect this to me most delightful meeting of all.

We welcome you most cordially. We are glad to be able to reciprocate in kind the many courtesies which we have received in other cities at your hands, and we hope this meeting will be as fruitful in results and as enjoyable to you all as any that has gone before.

Response by Dr. Seth C. Gordon

In behalf of the Fellows of the American Gynecological Society, I wish to thank you for your very cordial welcome to Boston and the hospitalities of the Boston Fellows, which are still fresh in our memories since our last visit.

We are always glad to come to Boston, as it is well known to most of us that being born in Boston obviates the necessity of being "born again," but as we were denied that most precious privilege, we are duly thankful for any opportunity to visit it, and doubly thankful when, as now, we can come as your invited guests.

From our boyhood days we read the story of the Boston Tea Party, Bunker Hill, Concord, and Lexington, where the "embattled farmers fired the shot heard round the world." We drew our inspiration and patriotism from Adams, Hancock, Knox, and others. We are glad to come to Boston because it is "cultured Boston." Although often spoken of lightly, it has fully merited the title.

Not many years ago the English critics taunted us with the question, "Who reads an American book?"

The echoes of the taunt had scarcely died away before Old Oxford conferred her highest honors upon Oliver Wendell Holmes. *The Autocrat of the Breakfast Table* became the autocrat of American literature, and now everyone reads American books.

The *Atlantic Monthly* developed a galaxy of literary immortals. Motley, Bancroft, Everett, Lowell, Longfellow, Holmes, Hawthorne, and Emerson became household names throughout the literary world. There is a reason for the name of "cultured Boston."

We are glad to come to Boston to see the great work done in our own profession, and we behold the new home of Harvard Medical School and its necessary adjunct, the Peter Bent Brigham Hospital.

Finally, we are glad to come to Boston to twine a wreath of laurel around the name of the father of our Society, the charming fine Chadwick. "None knew him but to love him; none named him but to praise!" May his genial, kindly spirit ever remain a sweet remembrance with us!

The President. The members of the Boston Obstetrical Society are extended the privileges of this Society during its meetings. If there are any other persons who are desired as guests of the Society, we should like to have their names announced at this time, so that they can be extended the privileges of the floor.

The names of the following invited guests were announced, and these gentlemen were extended the privileges of the floor: Dr. James E. King, Buffalo, New York; Dr. M. L. Harris, Chicago, Ill.; Dr. E. A. Codman, Boston, Mass.; Dr. T. W. Hall, Boston; Dr. W. D. Gatch, Indianapolis, Ind.; Dr. Thomas Walker, St. John's, New Brunswick; Dr. A. V. Miller, Brattleboro, Vermont; Dr. Stanley D. Warren, Portland, Maine; Dr. William H. Bradford, Portland, Maine; Dr. Freeman Allen, Boston.

The President: In accordance with the regulations adopted last year, the nominations of officers for the coming year were made by the Committee of ex-Presidents this morning and are to be announced at this time. As I understand it these nominations stand unless other nominations are made from the floor.

Dr. Gordon: Your committee composed of ex-Presidents of the Society beg leave to make the following report as to nominations:

The ex-Presidents of the American Gynecological Society met at the Harvard Club, May 19, 1914, at 9 A.M., with Dr.

Matthew D. Mann as ex-President presiding and Dr. Gordon acting as Secretary.

For President we nominated Dr. Thomas J. Watkins, Chicago; First Vice-President, Dr. F. F. Simpson, Pittsburgh, Pennsylvania; Second Vice-President, Dr. Howard C. Taylor, New York City; Secretary, Dr. Le Roy Broun, New York City; Treasurer, Dr. J. Wesley Bovée, Washington, D. C.; Members of the Council: For four years—Dr. J. Whitridge Williams, Baltimore; For one year—Dr. Frederick J. Taussig, St. Louis, Missouri; and Dr. F. S. Newell, Boston.

Scientific Session

Papers were read as follows:

1. "Forward Fixation of the Cervix as a Predisposing Cause of Retrodeviations of the Uterus and an Operation for its Release," by Dr. Edward Reynolds, Boston.

This paper was discussed by Drs. Boldt, Byford, Stone, Bovée, Goodall, Ehrenfest, Gordon, and the discussion closed by the author of the paper.

2. "The Ultimate Results in One Hundred and Fifty-nine Gall-stone Cases Associated with Gynecological Conditions," by Dr. John G. Clark, Philadelphia.

The paper was discussed by Drs. Peterson, Harris, and in closing by the essayist.

3. "An Internal Alexander Operation," by Dr. Henry T. Byford, Chicago.

Discussed by Drs. Schenck, Gellhorn, Stone, Simpson, Bovée, and discussion closed by the author of the paper.

Mr. Frank T. Fowler, of New York, demonstrated and explained the uses of the lungmotor. He said it is a simple, safe, and precise device for mechanically inducing artificial respiration that is applicable in any case where artificial respiration is indicated, as in asphyxia by gases or fumes, asphyxia at birth, electric shock, mining accidents, apparent drowning, strangulation, smoke, steam, caisson disease, collapse during anesthesia, etc.

On motion, the Society adjourned until 2.30 P.M.

Afternoon Session.—The Society reassembled at 2.30 P.M., and was called to order by the President.

4. "The Effect of Laparotomy upon the Circulation," by Dr. W. D. Gatch, Indianapolis, Indiana, by invitation.

5. "Recent Experiments Defining the Dangers of Anesthesia," by Dr. Yandell Henderson, New Haven, Connecticut, by invitation.

6. "Nerve Blocking as a Substitute for General Anesthesia in Surgical Operations," by Dr. M. L. Harris, Chicago, by invitation.

7. "Spinal Anesthesia," by Dr. George Gellhorn, St. Louis, Missouri.

These four papers were discussed together by Drs. Allen, Polak, Gordon, and the discussion closed by Drs. Harris and Gellhorn.

On motion, which was duly seconded and carried, a vote of thanks was extended to Drs. Gatch, Harris, and Henderson for their interesting and instructive papers.

On motion, the Society adjourned until 9.30 A.M., Wednesday.

SECOND DAY.—*Wednesday, May 20, 1914.*

Morning Session.—The Society met at the Country Club, and was called to order at 9.30 A.M., by the President.

8. "Efficiency Studies in Gynecological Diagnosis," by Dr. Robert L. Dickinson, Brooklyn, N. Y.

9. "A Study of Hospital Efficiency, with Particular Reference to Product rather than Expenditure," by Dr. C. A. Codman, Boston, by invitation.

These two papers were discussed together by Drs. Harris and Broun.

The hour set for the delivery of the President's Address having arrived, Dr. Howard C. Taylor, Second Vice-President, was called to the Chair.

President Williams then delivered his address. He selected for his subject, "Has the American Gynecological Society Done its Part in the Advancement of Obstetrical Knowledge?"

At the conclusion of the address, Dr. Gordon moved that a vote of thanks be tendered to the President for his admirable and instructive address, which was seconded and carried.

Dr. Edward P. Davis moved that a vote of thanks be extended to Dr. Codman for the interesting and valuable matter

which he had placed at the disposal of the Society. Motion seconded and carried.

Dr. Brooks H. Wells, New York City (at the request of the Council), delivered a "Memorial Address on Dr. Henry J. Garrigues."

The address was discussed by Dr. George Tucker Harrison.

10. "A Critical Review of Five Hundred Published and Unpublished Cases of Abdominal Cesarean Section for Eclampsia," by Dr. Reuben Peterson, Ann Arbor, Michigan.

Discussed by Drs. Davis, Hirst, and Williams.

On motion, the Society adjourned until 2 P.M.

Afternoon Session.—The Society reassembled at 2 P.M., and was called to order by the President.

11. "Can Surgery be Eliminated in the Treatment of Fibroid Tumors of the Uterus?" By Dr. John A. McGlinn, Philadelphia.

The paper was discussed by Drs. Brettauer, Dickinson, Goodall, and Graves.

12. "The General Principles of the Mechanics Involved in the Cause and Surgical Relief of Downward and Backward Displacement of the Uterus," by Dr. George H. Noble, Atlanta, Ga.

13. "Notes on Vesico-uterine Transposition," by Dr. Thomas J. Watkins, Chicago, Ill.

14. "A Study of the End Results of Interposition of the Uterus for Prolapse," by Dr. John O. Polak, Brooklyn, New York.

15. "A Further Development of an Original Technique for Separately Uniting the Five Structures Injured in Lacerations of the Pelvic Floor," by Dr. Barton Cooke Hirst, Philadelphia.

The discussion on these papers was opened by Dr. Studdiford and continued by Drs. Stone, Cragin, Gordon, Reynolds, Harris, Cushing, Bovée, Brettauer, Mann, Gellhorn, and the discussion closed by Drs. Watkins and Hirst.

The hour for the business meeting having arrived the Society went into executive session.

Business Meeting.

The Society being called to order the Minutes of the last meeting were presented as published in the Transactions

and on motion were approved. The Treasurer's report was made, and after being audited and the vouchers found correct, it was accepted and ordered placed on file. The Secretary announced that the Council had unanimously recommended for Fellowship the following named candidates:

Dr. Arthur H. Curtis, Chicago.
Dr. Charles C. Norris, Philadelphia.
Dr. Edward A. Schumann, Philadelphia.
Dr. Josiah Morris Slemons, San Francisco.

On separate ballot each of these nominees was elected a Fellow of the Society.

The Secretary notified the Society of the requests of Drs. B. F. Baer, Thomas A. Ashby, Francis H. Davenport, and Eugene C. Gehrung, Active Members, to be transferred to the Honorary List, they having fulfilled the requirements of the Constitution. The requests of these members were accepted.

The Secretary submitted to the Society for its consideration a proposal by the Council that Paragraph IV, Section 111, of the Constitution be amended to read as follows:

"Candidates for Active Fellowship shall be graduates of medicine of at least ten (10) years' standing and shall be proposed to the Council, by two Fellows *only*, at least two months before the first day of the meeting, each nomination being accompanied by a list of the principal publications of the candidate and of the official positions which he holds. On nomination by the Council, each candidate shall be separately balloted for at the annual meeting. A two-thirds affirmative vote of all the Fellows present shall constitute an election, at least fifteen Fellows being present.

"The names of any candidates not nominated by the Council or not elected by the Society shall be placed upon a waiting list and shall be reconsidered by the Council at each succeeding meeting. A list of all the candidates, accompanied by the names of their proposers, their official positions, and their principal publications, shall be sent to every Fellow with the notification of the annual meeting."

This amendment was ordered filed and submitted at the next meeting of the Society.

The Council recommended that White Sulphur Springs, West Virginia, be selected as the next place of meeting. The Secretary read a letter submitted by the Manager of the White

Sulphur Springs Hotel, giving the Society such information as they would wish regarding rates, etc. The French Lick Springs was also suggested from the floor. The choice of the place of meeting was left to the Council.

The nominations for the various officers being in order, they were read by the Secretary as previously submitted. They were as follows:

President—Thomas J. Watkins, Chicago.

First Vice-President—Frank Farrow Simpson, Pittsburgh.

Second Vice-President—Howard C. Taylor, New York.

Secretary—Le Roy Broun, New York.

Treasurer—J. Wesley Bovée, Washington.

Council for Four Years—J. Whitridge Williams.

Council for One Year—Frederick J. Taussig, Franklin S. Newell.

There being no further nominations, on motion the nominations were closed and the Secretary was instructed to cast the ballot of the Society for the names of those presented for the various officers. The Secretary cast one ballot for the names of the nominees above mentioned for the various offices. Other members of the Council are Reuben Peterson, Howard A. Kelly, and Henry C. Coe.

The Chairman of the Committee on Nomenclature, Dr. Robert L. Dickinson, presented a report. The Committee were authorized to print the report for distribution, for the purpose of comment and suggestion before being submitted for adoption.

The Secretary announced that the Society was only in possession of one set of TRANSACTIONS, and that it was important that a second set now incomplete should be filled out with the needed volumes, which could only be obtained through the desire of members to donate the missing volumes.

There being no further business the Society adjourned.

LE ROY BROUN,
Secretary.

THIRD DAY.—*Thursday, May* 21, 1914.

Morning Session.—16. "The Relation of the Abdominal Cutaneous Reflexes in the Common Acute Processes within the Abdomen," by Dr. Richard R. Smith, Grand Rapids, Michigan.

Discussed by Dr. Harris.

17. "The Clinical Manifestations of Disease of the Glands of Internal Secretion in Gynecological and Obstetrical Patients," by Dr. Robert Tilden Frank, New York City.

The paper was discussed by Drs. Graves, Watkins, Gellhorn, Ehrenfest, Mann, Reynolds, Boldt, Morley, and the discussion closed by the essayist.

18. "Complete Sterilization of the Skin with Iodin," by Dr. J. Wesley Bovée, Washington, D. C.

19. "Technique of Hysterectomy Since the Introduction of Iodin as a Sterilizing Agent," by Dr. I. S. Stone, Washington, D. C.

Discussed by Drs. Studdiford, Graves, Byford, Peterson, Bovée, and the discussion closed by Dr. Stone.

Dr. Henry T. Byford moved that a vote of thanks be extended to the Boston members and to those who had entertained the Society during this meeting.

Motion seconded and carried.

Dr. Williams, in retiring as President, said he could only thank the members for the courtesies they had shown him and express his great pleasure in having presided over the meeting on this occasion.

Dr. Edward Reynolds. I think I voice the feelings of the members of the Society when I say we have nothing but gratitude and admiration for the able manner in which this meeting has been so successfully conducted by the officers, and I will put the motion myself that the thanks of the Society be extended to the President and other officers for the work they have done and for the manner in which they have conducted this meeting.

Motion carried unanimously.

LE ROY BROUN,
Secretary.

CONSTITUTION

I. This Society shall be known as the AMERICAN GYNECOLOGICAL SOCIETY.

II. The object of this Society shall be the promotion of knowledge in all that relates to the Diseases of Women, to Obstetrics, and to Abdominal Surgery.

FELLOWS

III. The Fellows of this Society shall consist of Fellows and Honorary Fellows.

The Fellows shall not exceed one hundred in number.

The Honorary Fellows shall not exceed ten American (exclusive of those who have been Active Fellows of the Society) and twenty-five foreign.

Candidates shall be proposed to the Council, by two Fellows *only*, at least one month before the first day of the meeting, each nomination being accompanied by a list of the principal publications of the candidate and of the official positions which he holds. Each candidate shall submit *eleven* copies of his original and unpublished thesis to the Secretary of the Society not later than one month before the first day of the meeting, on a subject connected with gynecology, obstetrics, or abdominal surgery; this thesis shall not have been previously read or presented by title before any society. On nomination by the Council, each candidate shall be separately balloted for at the annual meeting. A two-thirds affirmative vote of all the Fellows present shall constitute an election, at least fifteen Fellows being present.

The names of any candidates not nominated by the Council or not elected by the Society shall be placed upon a waiting list and shall be reconsidered by the Council at each succeeding meeting. When the name of the candidate is placed upon the waiting list a copy of his paper shall be returned to him for publication if he so desires, but any such candidate shall have the privilege of submitting another paper to

the Council one month before the first day of the succeeding annual meeting. A list of all the candidates, accompanied by all the information sent to the Council, shall be sent to every Fellow with the notification of the annual meeting.

No one shall be eligible for Active Fellowship until he shall have submitted to the Council a paper on some subject connected with gynecological science.

HONORARY FELLOWS

IV. The power of nominating Honorary Fellows shall be vested in the Council.

No Honorary Fellow shall be voted on at the same Annual Meeting at which his name is recommended by the Council; but at the next succeeding Annual Meeting, except in the case of active Fellows of the Society being transferred to the Honorary List.

The election shall take place in the same manner as that of ordinary Fellows.

They shall enjoy all the privileges of other Fellows, but shall not be required to pay any fee or be allowed to hold any office, or to cast any vote.

Any member of this Society at the end of twenty-five years' active service in the Society, or at any time thereafter, at his own request, shall be placed on the roll of Honorary Fellows, and shall be so classified in the next volume of TRANSACTIONS, provided the request be made during the fiscal year for which the annual dues have been paid by that member.

OFFICERS

V. The officers of the Society shall be a President, two Vice-Presidents, a Secretary, and a Treasurer, and two other Fellows, all to be elected annually, who, with four other Fellows, one to be elected each year for a term of four years, shall constitute the Council of the Society.

The nomination of all officers shall be made in open session at the business meeting, and the same shall be elected by ballot.

The officers shall enter upon their duties immediately before the adjournment of the meeting at which they were elected, and shall hold office for one year.

Any vacancy occurring between the annual meetings shall be filled temporarily by the action of the Council.

All officers shall be eligible for re-election.

ANNUAL MEETING

VI. The annual meeting of the Society shall be held regularly at a date to be determined by the Council, and shall continue for three days, unless otherwise ordered by vote of the Society at any executive session. The sole management of the annual meetings shall be under the control of the Council, subject to any action of the Society at the preceding annual meeting.

AMENDMENTS

VII. This Constitution may be amended by a two-thirds vote of all the Fellows present at an annual meeting, provided that notice of the proposed amendment has been given in writing at the annual meeting next preceding, and that the same has been printed in the notification of the meeting at which the vote is to be taken.

BY-LAWS

PRESIDENT AND VICE-PRESIDENTS

I. The President and Vice-Presidents shall discharge the duties belonging to their respective offices. The President shall be *ex-officio* chairman of the Council.

SECRETARY

II. The Secretary shall attend and keep a record of all the meetings of the Society and of the Council, of which latter he shall be *ex-officio* clerk, and when not in session shall perform its business by correspondence.

At each annual meeting he shall announce the names of all who have ceased to be Fellows since the last report.

He shall superintend the publication of the TRANSACTIONS, under the direction of the Council.

He shall notify candidates of their election to Fellowship.

He shall send notifications of the annual meetings and of the meetings of the Council.

TREASURER

III. The Treasurer shall receive all moneys due and pay all debts. He shall render an account thereof at the annual meeting, when an Auditing Committee shall be appointed to report.

COUNCIL

IV. The Council shall meet as often as the interests of the Society may require.

Five members shall constitute a quorum.

It shall have the management of the affairs of the Society, subject to the action of the Society at its annual meetings.

It shall arrange the order for the reading of papers at the annual meetings.

It shall not have power to make the Society liable for any debts exceeding in total one hundred dollars in the course of any one year, unless specially authorized by a vote of the Society.

It shall have the entire control of the publications of the Society, with the power to reject such papers or discussions as it deems best.

The President, or any three members, may call a meeting, notice of which shall be transmitted to every member two weeks previous to the meeting.

The Council shall determine questions by vote, or—if demanded—by ballot, the President having a casting vote.

The Council shall constitute a Board of Trial for all offences against the Constitution and By-laws, or for conduct unbecoming an honorable physician, and shall have the sole power of moving the expulsion of any Fellow.

ORDER OF BUSINESS

V. The Order of Business at the annual meetings of the Society shall be as follows:

I. General meetings at 10 A.M. each day.
   1. Reports of the Committees.
   2. Reading of Papers and Discussion of the same.

II. The Business Meeting, at which only Fellows of the Society shall be present, shall be held on the second day of the session, at an hour determined by the Council and announced on the program of the meeting. The Secretary's Record shall then be read; the Treasurer's accounts be submitted; the reports of Committees or other than scientific subjects be received; and all miscellaneous business be transacted.

PAPERS, ETC.

VI. The titles of all papers to be read at any annual meeting shall be forwarded to the Secretary not later than *two weeks* before the first day of the meeting.

No paper shall be read before the Society which has already been printed or has been read before another body.

All papers that may be read before the Society, and accepted for publication, shall become the property of the Society, and their publication shall be under the control of the Council. Such papers may be published in full in medical journals, provided that they are also printed in the TRANSACTIONS.

QUORUM

VII. A quorum for business purposes shall be fifteen Fellows.

DECORUM

VIII. No remarks reflecting upon the personal or professional character of any Fellow shall be in order at the annual meetings, except when introduced by the Council.

ASSESSMENTS

IX. Every Fellow shall pay in advance the sum of twenty dollars annually.

Any Fellow whose subscription shall be more than nine months in arrears shall be reminded of the fact by the Treasurer in writing; in event of payment not being then made, he may, on vote of the Council, be dropped from the Society.

Each Fellow shall pay on admission an initiation fee of twenty-five dollars.

Any Fellow who shall neither attend nor present a paper for three successive years shall, unless he offers an excuse satisfactory to the Society, be dropped from Fellowship.

AMENDMENTS

X. Any of these By-laws may be amended, repealed, or suspended by a two-thirds vote of the Fellows present at any meeting. *Provided,* Previous notice in writing has been given at the annual meeting immediately preceding the one at which the vote is to be taken.

PAPERS

READ AT THE

THIRTY-EIGHTH ANNUAL MEETING

OF THE

AMERICAN GYNECOLOGICAL SOCIETY

HELD AT

BOSTON, MASSACHUSETTS,

MAY 19, 20, AND 21, 1914

ADDRESS OF THE PRESIDENT

HAS THE AMERICAN GYNECOLOGICAL SOCIETY DONE ITS PART IN THE ADVANCEMENT OF OBSTETRICAL KNOWLEDGE?

By J. Whitridge Williams, M.D.
Baltimore, Maryland

My first duty on this occasion is to express to the Fellows of the Society my deep appreciation of the honor they have conferred upon me in making me their President. However unworthy I may be for the post, I am greatly interested in the welfare of the Society, and my interest in it began long before I studied medicine, as the result of conversations with my old friend, Dr. William T. Howard. As a boy I remember him, describing the meetings to my father, and relating what his friends Barker, Sims, Thomas, Emmet, Peaslee, and others had said. At that time I thought that the Society was the embodiment of all wisdom, and I looked forward to the time when I could be a member. Thanks to the kindness of my friends that ambition was gratified at the age of twenty-six years, when half of the thirty-nine founders were still active members. Consequently, I became at least partly imbued with the original spirit of the Society, and as I preside over its deliberations I recall very vividly my obligations to some of the great men of its early days.

During the past year our ranks have been lessened by three losses, one active and two honorary Fellows.

William H. Wathen died October 7, 1913, aged sixty-seven years. I cannot let the opportunity pass without recalling his kindly and energetic personality and expressing our genuine sorrow at his loss, while some one better fitted than I will record his professional work and achievements.

Henry J. Garrigues died July 7, 1913. While he had retired from active participation in the work of the Society, he will always be held in grateful remembrance by us, particularly on account of the part which he played in revolutionizing the lying-in hospitals of this country.

Prof. Ottavio Morisani, of Naples, died January 25, 1914, aged seventy-nine years. An Honorary Fellow since 1892, he has shed luster upon our Society and will occupy an honored place in medical history as the perpetuator and revivifier of symphyseotomy, long after his rare personal qualities have been forgotten.

When casting about for a suitable subject upon which to address you, it occurred to me to read all of the obstetrical articles which have been contributed to the Society since its inception, in the hope that their analysis might prove interesting to our older and stimulating to our younger members.

During the thirty-eight years of its existence 1010 papers have been contributed, 664 upon gynecological and 346 upon obstetrical topics, including extra-uterine pregnancy. Consequently a little more than one-third (34.2 per cent.) fall in the latter category and were contributed by 128 individuals. Of these 53 made only a single contribution, while 50 read from two to four papers each, 22 from five to nine, and 3 ten or more papers, so that somewhat less than one-fifth of the entire number were frequent contributors.

I found the task of reading the articles very interesting and fairly profitable, as they set forth in a more or less consecutive manner the history of obstetrics for the past forty years, and served to impress me anew with the great progress which had been made in the technical side of our art.

During this period we have witnessed many changes, the most far-reaching being the development of aseptic technique and the establishment of the bacterial origin of puerperal infection, as the result of which the lying-in hospital has been converted from the most dangerous to the safest place for the delivery of women. Every stage in the development of this doctrine can be traced in our TRANSACTIONS. In the early volumes one finds articles showing that vaginal and intra-uterine douches could be administered with safety, along with others giving directions for the most rudimentary antiseptic technique.

It may surprise some of our younger members to learn that so late as 1884 Albert H. Smith, in his presidential address, vigorously combatted the bacterial origin of infection; and on the other hand, that members of the Society took an active part in the transformation of the lying-in hospitals. For example, we read with pride of Garrigues' achievements at the New York Maternity Hospital in 1883. In the first nine months of that year, 30 deaths from infection had occurred in 345 deliveries, but the changes which he so intelligently introduced effected such a revolution that during the last three months of the year not a single patient died, and only 3 of the 95 presented a rise in temperature. Furthermore, Polk told us that when he graduated in medicine delivery in a lying-in hospital was far more dangerous than engagement in the bloodiest battle, for during his interneship at Bellevue he saw 45 women die out of the 60 who had been delivered during a single month.

In the papers of Garrigues and Jewett we can also trace the history and development of laparo-elytrotomy, the latter having told us that 6 women and 7 children had been saved in 11 operations up to 1885. This operation is of great interest to students of medical history, as its invention by Thomas represents one of the very few American contributions to obstetrics; while its recent resuscitation

under the guise of extraperitoneal Cesarean section shows that his conceptions were well founded.

The conversion of Cesarean section from "the most dangerous operation in surgery" to one whose results are so good that it is in imminent danger of being abused by "knife-loving" obstetricians and by surgeons who know nothing of the resources of obstetrics, can be graphically followed. The early accounts of tardy operations for the removal of a dead child from an exhausted and infected woman stand in marked contrast to the first elective operation performed by Lusk in 1887, but particularly to the long series of successful operations which were afterward reported by many of our Fellows.

Following Harris' paper in 1892, entitled "The Remarkable Results of Antiseptic Symphyseotomy," we can trace the development and fall from favor of that operation, as well as the scant recognition accorded the usefulness of its sister operation, pubiotomy.

One of the most interesting phases of obstetrical history is afforded by the 51 papers upon extra-uterine pregnancy. In these we can trace the evolution of a pathological curiosity into a condition of every-day occurrence. Furthermore, we can follow the education of the profession in its diagnosis, as well as the gradual development of means for its cure, first by electricity or by the injection of morphin into the sac and later by surgical methods. We can likewise trace the development of the "*furor operativus*" to the point where the diagnosis of the condition came to mean immediate operation without regard to the condition of the patient, until Robb's experimental work demonstrated that interference might frequently be deferred with benefit to the patient.

Many other changes can be followed with interest and profit. For example, the slow recognition of the fact that occiput-posterior presentations should not be regarded as

abnormal, but that if left alone they will usually terminate spontaneously with but little greater difficulty than when the occiput is directed anteriorly.

We can also follow the evolution of more correct views concerning the employment of forceps, and the recognition that its improper use is a potent factor in the death of the child and in the production of serious lesions on the part of the mother. Likewise, we can read the discussions concerning the value of axis-traction; but just as its merits were beginning to be recognized, its field of usefulness became markedly restricted by the knowledge that it is not the ideal means of overcoming mechanical obstruction.

It is interesting to recall the fact that in the early days of the Society not even trained obstetricians were agreed as to the necessity for the immediate repair of birth injuries, for at the first meeting in 1876 Goodell contributed an important communication setting forth the innocuousness and desirability of routine perineal repair.

I might continue to recount many other advances in the practical treatment of childbirth and its complications, but time will not permit. Consequently I shall refer only to the abuse of ergot. Its employment was considered upon several occasions in the early days of the Society, when the consensus of opinion developed that it was indicated only after the extrusion of the placenta. It may also interest you to be reminded that it was frequently administered so freely in the treatment of abortion as to give rise to chronic ergotic poisoning, and that John Goodman reported an instance in which it had led to gangrene of the extremities. I lay stress upon this almost forgotten fragment of medical history, for I believe that unless correct teachings concerning the action of, and the indications for, the use of the various preparations of pituitary gland substance soon become current, a similar crusade will be necessary to check the abuse of this powerful therapeutic agent.

After listening to this imperfect enumeration of the advances of obstetrics as portrayed in our TRANSACTIONS, one's first impulse is a feeling of pride in the achievements of his colleagues and a sense of satisfaction with the part we have played in developing this branch of medicine. Closer and candid consideration, however, compels the depressing confession that such feelings are not justified, but that on the contrary we have done practically nothing in developing even the practical side of our art, as we have been content merely to follow in the footsteps of others—and occasionally quite sluggishly—and to reap what we have not sown.

Careful analysis of our TRANSACTIONS has failed to convince me that scarcely a single fundamental contribution to practical obstetrics has been made to this Society, and I feel that you will agree with me when you hear the facts.

We did nothing fundamental in connection with the question of puerperal infection—Holmes, Semmelweiss, Pasteur, and Tarnier laid its theoretical foundations, while the practical utility of antiseptic precautions had been demonstrated in Germany and France before we seriously faced the matter.

The modern Cesarean section originated in Germany, and five years elapsed after the publication of Sänger's monograph before we were able to report a single successful operation.

The same may be said of symphyseotomy and pubiotomy, and it was not until after Harris had called attention to the results obtained in Italy and France that we showed signs of being aware that the operation had been successfully resuscitated. Even in connection with extra-uterine gestation we have little reason to be proud, as the operation after rupture came to us from Tait, while Veit had given directions for diagnosing unruptured tubal pregnancy

four years previous to the subject being mentioned before this Society.

Likewise our views concerning the mechanism of labor in occiput-posterior presentations were wofully behind the times, and it required years for us to reach the position which Naegle had attained in 1838. Naturally it might have been supposed that the mechanical ingenuity of the nation would have led to improvements in the forceps. But not so. For while we were inventing narrow-bladed instruments which might be applied through a cervix the size of a 5-cent piece, Tarnier had worked out the principle of axis-traction, which we accepted only after considerable hesitation.

I shall not continue this doleful list further, as it seems sufficient to prove that we have added practically nothing to the technical side of obstetrics, while the analysis which I am about to present will show that we have done even less on the scientific side.

For purposes of analysis I have classified the 346 obstetrical papers into 32 groups, as shown by the table on page 10.

With as little bias as possible I have attempted to form a judgment as to the value of the papers, and I have designated as good or creditable those in which the subject under consideration was presented in a useful and attractive manner, but without adding anything new, and as excellent such papers as have contributed, even to a slight extent, to the sum total of obstetrical knowledge. Judged by these criteria I have placed 42 papers in the former and 27 in the latter category, 12 and 8 per cent. respectively. Consequently it would appear that on the average less than 2 creditable papers have been contributed each year, and that only 2 contributions could be expected in three years. Surely this is not a showing of which our Society can be proud.

Analysis of the Obstetrical Papers, 1876–1913.

		Subject.	Number of papers.	Creditable.	Excellent.
a	1.	Pregnancy, abnormalities of	20	3	2
	2.	" and labor complicated by tumors	13	1	
	3.	" operations during	2		
	4.	" physiology of	11	2	3
b	5.	Labor, abnormalities of	8	..	2
	6.	" conduct of, including anesthesia and ocytocics	29	5	1
	7.	Labor, mechanism of	2	..	1
	8.	" physiology of	1	..	1
c	9.	Puerperium, abnormalities of	5		
	10.	" normal	6	..	1
	11.	" infection during	25	3	1
d	12.	Lacerations of cervix	5	1	
	13.	" of perineum	9	2	
	14.	Rupture of uterus	8		
	15.	Vesicovaginal fistula	1	1	
e	16.	Operative technique	1		
	17.	Accouchement forcé and induction of labor	12	1	
	18.	Cesarean section	25	2	1
	19.	Forceps	6		
	20.	Gastro-elytrotomy	2	1	
	21.	Pubiotomy and symphyseotomy	7	3	1
	22.	Version	2		
f	23.	Abortion	2		
g	24.	Extra-uterine pregnancy	51	7	5
h	25.	Eclampsia, toxemia, and vomiting	28	3	2
i	26.	Contracted pelvis	7	2	3
j	27.	Hemorrhage, accidental	1		
	28.	" postpartum	3		
	29.	Placenta previa	17	1	1
k	30.	Displacements of uterus	7	..	1
l	31.	Child	10	2	
	32.	General	20	2	1
		Total	346	42	27

On the other hand, I would call attention to the fact that 70 papers, or somewhat more than one-fifth of the entire number, were purely casuistical in character and were based upon the history of one or at most two cases. While often interesting, papers of this character are usually of little value, and are better suited for presentation before

a local medical society than before a national association supposedly composed of scientific men.

Most of the remaining 207 papers were unobjectionable, but, while sometimes provocative of interesting discussion, they served merely as vehicles for the expression of the personal experiences of their writers. A small number, including an occasional thesis for admission, were valueless and sometimes puerile. In general these papers were practical in character and dwelt but little upon the scientific or theoretical aspects of the subject. Many of them were based upon an experience too small to justify authoritative conclusions, and were such as might be expected from young assistants after a few years' service in a well-conducted clinic. It would therefore, appear that their chief function was to afford the author an opportunity to air his views at the expense of the Society upon topics of more or less general interest and to educate the general practitioner, rather than to stimulate free exchange of thought between competent experts with a view to broadening their field of vision and increasing the general store of knowledge.

Reverting to the analysis of the papers I found 6 creditable and 4 excellent communications among the 46 included in the four groups devoted to pregnancy (*a*). I was greatly surprised, however, at the dearth of papers upon many important subjects. For example there was an entire absence of reference to the biological and biochemical aspects of pregnancy, and with the exception of a demonstration by Minot, no mention was made of the fundamental problems connected with placentation. Nothing was said of normal metabolism during pregnancy, and had we been dependent upon the Society for information, we should have been unaware of the significance of Abderhalden's pregnancy reaction.

Furthermore only once during the life of the Society has reference been made to the importance of syphilis in

connection with the child-bearing process, and that only in an incidental manner. As my own experience leads me to believe that this is the most important single factor concerned in the death of the fetus during the last three months of pregnancy, I feel that had we been alive to our responsibilities we should have had numerous communications concerning the bearing of the discovery of the spirochete and of the Wassermann reaction upon the validity of the laws of Colles and Profeta, as well as upon the practical aspects of prophylaxis and treatment.

In the four groups including the various phases of labor there were 40 articles (*b*), of which 5 were good and the same number excellent. Most of these dealt with the purely practical aspects of mechanical delivery. On the other hand, no mention was made of our ignorance concerning the causation of labor nor of the physiology of uterine contractions, and although a number of writers dealt with the management of abnormal presentations, only one made a contribution to the mechanism of labor and another to the anatomy of the parturient soft parts. Did time permit, many other important problems might be mentioned which have been left entirely untouched.

Of the 36 articles included in the three groups dealing with the puerperium (*c*) 4 were creditable and 2 excellent. Their analysis shows that practically none of the many problems connected with the normal aspects of this period had been considered, and that only two authors had dealt with the fascinating process of involution, and then only from a clinical point of view. Furthermore no one suggested that investigations during this period will probably eventually solve the riddle of the mode of production of retrodisplacements of the uterus, and thus do away with one of the opprobria of gynecology.

Careful perusal of the 25 papers upon puerperal infection indicates very accurately the general point of view

of the Society. With one exception no serious contribution to the bacteriology of the affection has been made, but the members have been more interested in discussing such questions as whether hysterectomy is the ideal treatment for desperate cases rather than in studying the mode of origin and the clinical course of the disease in the hope of still further preventing its outbreak and eventually securing its elimination.

In the four groups dealing with injuries to the birth canal (*d*) there were three creditable but no excellent papers, and little need be said concerning them.

In the seven groups dealing with the various obstetrical operations (*e*) we find 55 papers, 7 of which were good and 2 excellent. This is a startling disappointment, as it is just in this field that one would expect to find important contributions resulting from American mechanical ingenuity. On the contrary, the papers in this group were unusually poor, and most of them consisted of reports of series of cases or of discussions concerning the indications for operation which were devoid of suggestions of value. That this is not an exaggeration is shown by the fact that only a single paper among the 25 upon Cesarean section brought forward an idea which was not already perfectly well known, while in the articles concerning several other operations suggestions were occasionally made which were at variance with sound practice.

Passing over two papers on abortion (*f*) we come to the largest group in our analysis, namely, 51 papers upon extrauterine pregnancy (*g*) with 7 good and 5 excellent communications. This represents a larger proportion of creditable papers than usual, but I do not think that we obstetricians can take much comfort from the fact, for upon looking over the list of authors it is found that the great majority were pure gynecologists, who would feel aggrieved were they accused of having any particular knowledge of obstetrics.

Here again most of the papers consisted of casuistical reports or of discussions concerning the necessity for operation or of details of technique. Several articles were based upon experimental work, but, with the exception of the reports upon several specimens of ovarian pregnancy, no mention was made of histological findings, of the interesting variations in placentation, nor of many of the important problems connected with the etiology of the condition.

In the group dealing with the toxemias of pregnancy, eclampsia, and vomiting (*h*) one finds 3 creditable and 2 excellent papers out of 28. The same criticism holds good here as elsewhere, for with a few notable exceptions most of the writers were more concerned with the consideration of methods for evacuating the uterus than with the study of the factors responsible for the production of the condition which made it necessary.

Passing on to the next group (*i*) one is surprised to find that during the course of thirty-eight years a body of obstetricians should have contributed only 7 papers specifically dealing with contracted pelvis. On the other hand this group of papers is unusually meritorious, as 2 were good and 3 excellent. Of course the subject was also considered incidentally in connection with the various operative procedures, but it seems strange, in view of its great practical importance and of the unsatisfactory conditoin of our methods of diagnosis and classification, that it has not evoked greater interest.

Considering together the three groups dealing with the various types of hemorrhage (*j*) we find 1 creditable and 1 excellent paper in 23. The great majority of these communications had to deal with placenta previa and more particularly with the determination of the most conservative method of effecting delivery in the presence of this complication. With but few exceptions, however, I was surprised to find that the experience of most of the writers

upon the subject was too limited to permit the formulation of authoritative conclusions, and that many of the articles consisted in great part of literary references and didactic utterances. As usual there was but scanty consideration of the mode of causation of the abnormality or of the anatomical peculiarities associated with it. Indeed the only contribution to the subject was made in the early days of the Society.

We find seven papers in the group treating of displacements of the uterus (*k*), the most important of which had to deal with dystocia following operations performed for the relief of retrodisplacements, and one of them constituted a real contribution to the subject. In view of the fact that at least one-quarter of all women develop retrodisplacements following the first confinement it appears strange that more attention has not been paid to the etiological significance of its appearance in the late puerperal period.

In the last two groups, covering the child and the communications upon general obstetrical topics (1), there were 30 papers, which I shall dismiss with the statement that 4 were creditable, while 1 constituted a distinct contribution.

Doubtless many of my hearers may consider this analysis a harsh arraignment of the obstetrical members of the Society, but I feel sure had it been seemly to mention names and to specify titles that many would agree to it, though it is possible that a more lenient critic might have made longer the list of creditable and excellent papers. It is unnecessary for me to state that the analysis was not undertaken in a captious spirit, but was dictated by my interest in obstetrics and by my affection for this Society, and in the hope that by laying bare our weak points I may possibly stimulate some of our members to better work.

If my estimate is correct that only 27 of the 346 papers were excellent, the conclusion is inevitable that the American Gynecological Society has not done its part in the advance-

ment of obstetrical knowledge. If this is admitted, and I fail to see how any other conclusion can be reached, the query naturally arises as to whether the failure to do so is to be attributed to the character of our membership or to some more deep-lying factor.

When we canvas the list of members, both past and present, and the important teaching and hospital posts held by them, and also recall the careful scrutiny to which they were subjected before being elected, it must be admitted that with few exceptions the Society includes the foremost representatives of American obstetrics. This being the case it follows that the lack of productiveness cannot be due to failings of the individual members, but should be attributed to some nation-wide cause, whose explanation must be sought in factors peculiar to American conditions.

As far as I have been able to ascertain only three fundamental contributions to obstetrics have been by American writers, namely, "The Introduction of the Medicinal Use of Ergot," by John Stearns; "The Recognition of the Infectious Nature of Puerperal Fever," by Oliver Wendell Holmes; and "The Development of Laparo-elytrotomy," by T. Gaillard Thomas—the first a country practitioner, the second an anatomist and litterateur, and the third a professor of obstetrics. On the other hand, with few exceptions, American obstetricians have been content to appropriate and adapt the results of European investigators and to limit their writings practically to casuistical contributions and to the discussion of details of operative technique.

Opinions may differ as to the national peculiarities which are responsible for this relative sterility, but I feel very strongly that three main factors are involved, namely, too great a tendency to regard the practice of medicine as an engrossing financial pursuit, defective ideals and tendencies in medical education, and the divorce in this country of gynecology from obstetrics.

With few exceptions all of us undertake the study of medicine as a means of making a livelihood, and consequently our first aim is to obtain sufficient practical facility in our art to enable us to attain that end; and no one knows better than I what it means to do so, and how insistent are the demands of practice. Of those who are exclusively engaged in private practice, and who have not formed important hospital or teaching connections, little more can be expected than that they render their patients efficient service by keeping reasonably well abreast with the advance of knowledge and extend a sympathetic hearing to such of their colleagues as may try to add to it.

More, however, should be expected from those who have important hospital connections or hold teaching posts. The former fail to do their duty to the hospital and its patients if they and their assistants do not attempt to extend the limits of knowledge; while the latter cannot expect to stimulate their students or to train their assistants properly unless they teach them how little is really known and can open vistas of what may be accomplished by patient scientific work. The standing of such men should be judged not by the size of their income nor by the local consideration in which they are held, but by whether they make an occasional contribution to the science which they profess to love; and if they are content to publish mere casuistical reports or series of operations, they must be prepared to have others consider that they have wrapped their talent in a napkin and buried it.

To my mind, however, one of the most important factors in our lack of productivity is to be found in our system of medical education. Until very recently university ideals were entirely lacking in our medical schools, and even now in many institutions affiliated with universities the connection is purely nominal. How many of us, who hold professorships, can truthfully say that we are held to the same

accountability as the heads of the "true" university departments or are expected to justify our existence by an occasional contribution to science? Do not we, and the authorities as well, consider that our obligations have been satisfactorily fulfilled, if we teach a few hours each week, give decent care to the patients under our charge, and once or twice a year write a practical paper so that our professional friends may know that we are still alive? We must admit the indictment, but the fault is not altogether ours; for I think that not much more can be expected of us until the universities awake to the fact that medical education is a serious undertaking and is the most costly of all forms of instruction.

How many obstetrical departments are provided with proper accommodations for a sufficient number of patients for the instruction of students, with adequately paid and enthusiastic assistants, or with suitably equipped laboratories for research work, not to mention a salary for the director in any way commensurate with the ability and effort necessary to supervise the work in anything like an ideal manner? Real university departments are just beginning to be organized in some other branches of medicine, but I know of none in gynecology or obstetrics.

From extensive investigation I know that in most of our schools obstetrics is the least well-cared-for department, and must ordinarily be content with what is not wanted by others, while the professor is frequently regarded by his colleagues as being engaged in an almost unworthy pursuit. No doubt some professors are poorly trained and fulfil their obligations lightly, but I know many who take them seriously, and who feel depressed whenever they consider the status of their department and their inability to do better work. So long as such conditions exist it is scarcely conceivable that many professors will be scientifically productive, or will often be able to induce promis-

ing young men to devote themselves seriously to this branch of medicine, for the few men in this country who are really doing their duty, do so at great personal sacrifice and against odds with which they should not have to contend.

The third reason for the low state of American obstetrics is that this is the only country in the civilized world in which obstetrics and gynecology are sharply divided, and I may add that this is the only important gynecological society in which the majority of the members take no interest in obstetrical problems, or in which it could happen that a member on arising to discuss a paper would preface his remarks by stating that he knew nothing of obstetrics and then go on to make banal remarks.

Time will not permit me to discuss this phase of the subject at length, but I know that in this country neither gynecology nor obstetrics will take its proper place until a body of men has been developed who will be interested in and devote themselves to the study of the problems connected with the entire sexual life of women. I hope I may live to see the day when the term obstetrician will have disappeared and when all teachers, at least, will unite in fostering a broader gynecology, instead of being divided as at present into knife-loving gynecologists and equally narrow-minded obstetricians, who are frequently little more than trained man-midwives.

While it is debatable when a union of gynecology and obstetrics is feasible for those engaged exclusively in private practice, or would materially improve matters in most medical schools as at present organized, there is no doubt in my mind that the professorial chairs in the university medical schools need to be filled by broadly trained scientific men who are prepared to give their time to their duties. Such a development, however, is scarcely to be expected until the universities are prepared to equip and maintain woman's clinics, somewhat similar to the Frauenkliniks

of Germany, but more liberally provided with laboratories for the anatomical, chemical, pathological, and physiological investigation of gynecological and obstetrical problems. In this event the director must be an accomplished scientific man in addition to being a competent clinician, who will devote the major portion of his time to the conduct of his department. If he is of the proper type this will involve no sacrifice; but if he is not, he will be unhappy no matter how great the emoluments may be. Institutions of this character will also require the services of a large staff of well-trained and enthusiastic assistants, but will be able to make little use of the short-term interne who desires only a smattering of learning. Large endowment or State aid will be necessary for the support of such institutions, but I can conceive of no better expenditure of funds if it leads to fuller knowledge of the many unsolved problems connected with women and to the development of a body of men competent to undertake their investigation.

I hope to see a number of such institutions scattered over the land, and then no future president of this or any other society will be able to say that its members have not done their part in the advancement of obstetrical or or gynecological knowledge. We have heard from others of "the passing of a specialty," but I feel that there is a glorious future for the broader gynecology, which is as yet scarcely in its infancy. Let us do what we can to advance it.

AN INTERNAL ALEXANDER OPERATION

By Henry T. Byford, M.D.
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Retroversion of the uterus may be associated with general abdominal and pelvic visceroptosis, or it may be due to impaired function of one or more of the so-called uterine supports. In the latter case there is usually a secondary impairment of function of the remaining supports which are, of course, thrown out of normal action in consequence of the abnormal position of the uterus. An operation to relieve such a deformity does not necessarily have to attack all of the overstrecthed or relaxed structures, for, when the equilibrium of the uterus is restored and maintained for a certain length of time, those supporting structures which are only slightly deficient or are secondarily disabled may often be depended upon to resume function. In limiting myself to the consideration of this class of cases I am assuming that there is no defect in the pelvic floor, or that such defect has been remedied.

The operation which has proved most satisfactory under these conditions is the Alexander operation. It is one of the simplest of operations, consisting merely of drawing the round ligaments out through their normal channel, the inguinal canal, until the fundus is pulled to its normal position over the empty urinary bladder, and of reattaching them so as to eliminate their apparent excess in length. The part played by these ligaments in connection with retroversion and the Alexander operation is about as follows: The round

ligaments are relaxed when the bladder is empty, or nearly so, although they may be supposed to contract more or less irregularly and effectually when stimulated by the shiftings or motions of the uterus accompanying general physical exercise, forced respiration, coughing, defecation, etc. As the bladder fills and pushes the fundus uteri upward the ligaments are put upon the stretch and pull gently downward and forward until the emptying of the bladder enables them to contract and replace the fundus. When we consider the fact that they consist largely of muscular fibers and are apt to be temporarily exhausted by steady prolonged resistance, we can realize how retroversion may occur in a person with relaxed pelvic connective tissue who habitually allows the bladder and rectum to become and remain distended. I can conceive how overstretching of the round ligaments can thus become the chief defect, and the relaxation of the tissues behind the cervix may be of secondary importance, and how a restoration to function of the round ligament may become the rational and effective treatment.

When, however, we shorten them they are not only restored to action, but made to compensate, to a certain extent, for the relaxation of the cervical supports. We accomplish this by pulling the ligaments taut so that they will not allow the bladder to push the fundus quite so far back. Now if we did nothing more than this there is no doubt but the displacement would frequently recur as a result of the inefficiency of unaided muscle as a steady support, and the dilicacy of the connective tissue structure of the ligaments.

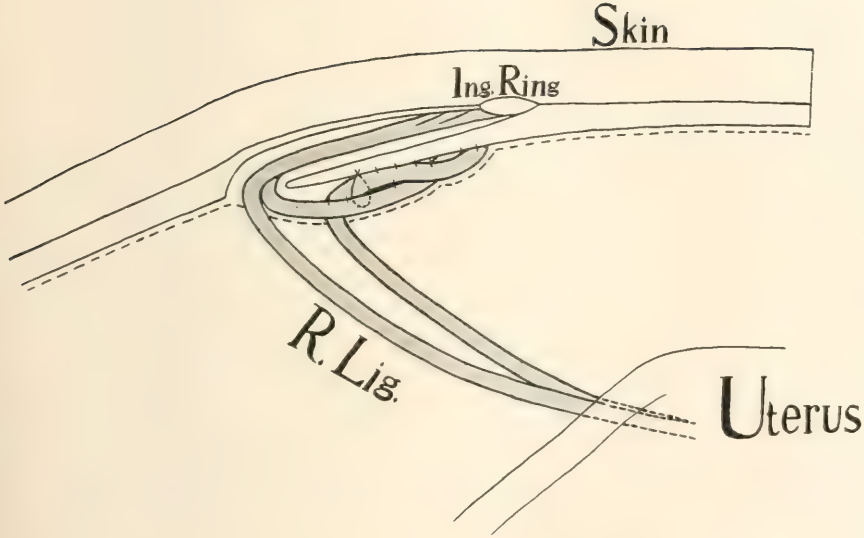
Hence to render a recurrence less likely we must warn the patient against holding the urine very long and provide some means of enabling the overstretched sacro-uterine ligaments to contract and regain some of their lost efficiency. A small pessary—one large enough to keep the cervix from coming too far forward during abdominal pressure, and to

help overcome the contraction of the vesicovaginal septum due to the prolonged forward dislocation of the cervix, yet small enough to allow of some play of the cervix and thus of some action of the cervical supports—will usually prove a valuable aid to the Alexander operation and render unnecessary any operative treatment of the sacro-uterine ligaments. Upon the removal of this samll-sized pessary after several months, the cervix is usually found to remain perceptibly farther back in the pelvis than it did right after the operation without a pessary.

When the peritoneal cavity is opened by a low median incision for complications of retroversion, or for other conditions, we can usually save time by shortening the ligaments through the incision instead of by the Alexander method. But all of the intraperitoneal methods that have been recommended have, as far as I have been able to determine, proved either unreliable or have been associated with objectionable features with regard to their conception or to the resulting complications. The simple folding of the round ligaments is unreliable. Suturing of the folds to the uterus usually produces peritoneal exudates which are often followed by pathological conditions of the organ with disturbance of its functions. Suturing of the folds to other parts is either unreliable or produces rigid exudates. The passing of the severed ligament, or a loop of it, through the abdominal wall substitutes a fixed displacement for a changeable one. It is more like carpenter work than surgery. and is only admissable when circumstances do not allow us to do better. I have not the time here for an enumeration of the objections to each of the numerous methods that have been recommended in our current literature, but they may be classified under the headings, unreliability, adhesions pathological exudates, abnormal position, restricted moblity, intraperitoneal traumatism, and fundamental errors in conception of objects to be accomplished.

The Alexander operation is freer from these objections than any of the intraperitoneal operative procedures, and in some cases, such as fat nullipara, I close the abdominal incision and perform it rather than enlarge the incision and subject the patient to the additional morbidity that so often follows the intraperitoneal methods under unfavorable conditions. The method I now employ, however, avoids intraperitoneal complications and leaves the parts in about the same favorable condition as the Alexander operation. It consists in making a fold near the distal end of the ligament and attaching it intra-abdominally but extraperitoneally, near the internal inguinal ring. Its execution, however, is so simple that a large incision is unnecessary, and it requires much less time, and occasions less trauma than an added Alexander operation. The steps are about as follows:

After having completed the intra-abdominal work for other conditions the round ligament is grasped by forceps and pulled out of the inguinal canal until it becomes taut. It is then transfixed by a needle threaded with fine chromic catgut at a point about 1 cm. from the internal ring and again about 3 or 4 cm. from the uterine end, and the thread tied so as to make a loop of ligament. The sides of the loop are then sutured with find chromic or plain catgut, forming a sort of double cord. The same is done on the other side and the parts palpated to determine, while there is still time to correct an error in judgment, whether the amount of shortening has been sufficient or excessive. The peritoneum is next separated freely from the abdominal wall low down on one side of the incision as far laterally as the internal inguinal ring. There is practically no resulting bleeding, and by inserting a short retractor between the peritoneum and rectus muscle one can raise the abdominal wall and do the subsequent work by the aid of sight and touch. With a slender, slightly curved pair of snap forceps



Showing the direction of the normal ligament into the internal inguinal ring, and the shortened ligament folded and attached to the abdominal wall near the internal ring. The dotted line represents the peritoneum.

a puncture from without inward is made in the peritoneal membrane near the internal inguinal ring and the end of the loop of ligament grasped and pulled through the puncture until the sutured portion of the ligament is all extraperitoneal. The loop is now given a half-twist upon itself and, with a curved needle and permanent suture passed through the sides of the loop a centimeter from its base, is sutured to the inner surface of the abdominal wall as near the internal ring as possible without danger of puncturing the epigastric artery. The loop of ligament which is practically a short double cord can now be horizontally sutured along the abdominal wall with as many or as few absorbable sutures as may seem advisable for the production of adequate adhesions. As the suture that makes the loop is a centimeter away from the internal ring and also from the permanent attachment suture, there is a little play of the ligament at the internal ring and some elastic traction exerted by the normal attachments in the inguinal canal. This play of the ligament prevents the muscular atrophy that takes place in it when it is drawn through the abdominal walls so as to suspend the uterus rigidly.

After finishing the operation on both sides the slight oozing of blood that may have taken place between the separated peritoneum and abdominal walls will have ceased and the intra-abdominal pressure will cause a firm coaptation of the raw surfaces as soon as the incision is closed. If the loop of ligament has been drawn carefully through a small peritoneal puncture, the peritoneal cavity will be completely shut off from the space in which the ligament is sutured, and this space can be safely disinfected with an efficient germicide. I usually sponge it out with a $\frac{1}{2000}$ solution of mercuric chloride in case there has been any chance for infection. I have never seen any bad results from separating the suprapubic peritoneum from the abdominal for this purpose.

Should the permanent suture give way and the ligament separate from its attachment to the abdominal wall the loop will still be held by its subperitoneal embedded attachment, for it cannot suddenly slip through the peritoneal puncture after having grown into it. Nor are the sides of the loop of round ligament very liable to be torn apart after having grown into the subperitoneal connective tissue. Hence the chances of failure are not as great as they would be if the success depended only upon attaching the ligament intraperitoneally to the inner surface of the abdominal parietes.

As the only intraperitoneal part of this method consists in making the small loop of ligament and suturing its sides together, and as this loop is drawn through a puncture until it entirely disappears from the peritoneal cavity, and as the ligament pulls from the neighborhood of the internal inguinal ring, I feel justified in saying that the intraperitoneal conditions after the operation, so far as the shortening of the ligaments is concerned, are the same as after an Alexander operation.

DISCUSSION

Dr. Benjamin R. Schenck.—Dr. Byford has given us an interesting variation of the round-ligament operation which, it seems to me, differs but little in its mechanical effect from the operation which he described in 1903. You will remember, perhaps, that he then described a procedure which consisted in taking up a sufficient amount of slack, suturing together the two folds of the ligament and attaching the end of the loop to the parietal peritoneum near the internal ring. His present variation in the making of an incision in the peritoneum, through which he draws the folded loop, which is then sutured subperitoneally. By this he gains the freedom from an exudate which might form around the stitches and also a more permanent result.

As I look at it this operation does not differ mechanically

from the Mayo or the Barrett modification of the Gilliam operation. In both of these modifications the side of the incision is lifted up and forceps are introduced over the rectus out under the subperitoneal tissue as far as the internal ring. Here the peritoneum is punctured and the ligament drawn through. These operations differ from that of Dr. Byford, in that the folds of the ligament are not sutured together, and also in that they are brought over the belly of the rectus muscle where they are fastened.

I think this paper properly brings up for discussion the whole question of the treatment of retroposition of the uterus when it is uncomplicated by lesions of the pelvic floor. It is perhaps a hackneyed subject, yet it is one of great importance, because of the great frequency of these cases and further because our ideas are still in an evolutionary stage. It is interesting, for instance, to take the proceedings of this Society, go back for a number of years and see how opinions have changed. In the early days there was great enthusiasm manifested for the Alexander operation; then, at a later date, there was considerable enthusiasm shown for suspensio-uteri. This was was specially manifested at the Atlantic City meeting in 1902; then at the Philadelphia meeting, in 1908, the views of many of our members had changed and became quite different from those expressed in 1902. This evolution has had to do with the Alexander operation, then with suspension, and then with the various intra-abdominal methods of shortening the ligaments.

In the old days the Alexander operation was successful or unsuccessful as it happened to be applied to uncomplicated cases or to those that were complicated by adhesions or disease of the adnexa. It was on account of these failures that suspension, which was the operation done when the abdomen first began to be opened extensively, became popular, and in turn it took years to ascertain the failures of the suspension operation. Now we have come back to the principle of the Alexander operation, but applied in such a way that we do not have the disadvantages of that operation. It seems to me the chief requisites for any operation for retroposition of the uterus are mainly four: (1) relief of the symptoms; (2) permanency of results; (3) freedom from trouble during pregnancy and danger during labor; (4) freedom from late trouble, such, for example as intestinal obstruction.

Although suspension has been charged with causing a number of cases of intestinal obstruction, still they have been few when one considers the vast number of suspensions which have been done. If the operation were to be condemned for this alone it would be unjust. But we know that it does interfere with labor in a larger percentage of cases than should be the case. On this account, and also because of the fact that one does not always get relief from some of the symptoms, we are coming to the various methods of intra-abdominal shortening of the round ligaments.

My own experience is as follows: Of 162 operations for retrodisplacements there were 99 suspensions. My general impression of these cases is that they have been quite satisfactory I occasionally do the Webster-Baldy operation—eleven times in all. I have had 6 Coffey operations and 46 Gilliam operations, including the various modifications. I was rather late in giving up the suspension operation, and have done so more because of the reports of others than from dissatisfaction with my own cases.

In no series of cases of retrodisplacement is the percentage of subsequent pregnancies high. So far as I know there have been only 4 instanes in my 162 cases; 2 were after suspension and neither had any untoward symptoms; 1 followed a Gilliam and was satisfactory in every way; 1 patient, on whom I had done a Coffey operation, went through pregnancy and labor without difficulty, but the retrodisplacement recurred.

Dr. George Gellhorn.—With all due respect to Dr. Byford's views I believe that the Alexander operation should be definitely eliminated from the list of operative procedures for retroflexion of the uterus. In uncomplicated and freely movable retroflexed uteri, as a general rule, no operation of any kind is needed. But who, after all, would be in a position to tell by mere bimanual examination whether the retroflexion is absolutely uncomplicated, whether there are not fine adhesions about the uterus or about the abdominal ostia of the tubes or around the ovaries? This difficulty alone should disqualify the Alexander operation in which we forego the advantages of both sight and touch, for if these adhesions remain behind they will give trouble in other respects, and, therefore, I believe, with the present comparative safety of laparotomy, any intra-abdominal operation is preferable to the Alexander

operation. What particular method should be used can be safely left to the judgment of the operator in the individual case, just so long as we do not swear by any one method, because it would be forcing the patient into a shoe that may not fit her if we use one and the same method in all cases.

Dr. I. S. Stone.—The operation which has been presented by Dr. Byford prompts me to say a few words, as since his preliminary report of this method last year I have had the opportunity of trying the method to my satisfaction. As we can readily understand, there is some doubt about any method which gives attachment of the ligament to the under side of the abdominal wall. There, to my mind, is the only weak point of the operation, and it seems that there should be greater strength and security if the ligaments were attached outside of the fascia, and that can be accomplished, if necessary, by using the Kelly curved needle and drawing the ligament through the abdominal wall, possibly under the skin. I want to mention one thing in connection with this operation, namely, that it is a little more difficult for me than it seems to be for Dr. Byford. We have been using local instead of general anesthesia, and it is exceedingly difficult for me to get the abdominal wall fairly well relaxed for the assistant to expose the field successfully while we are suturing the ligament to the abdominal walls. It seems to me this operation is a distinct advance in one respect over what is known as the Mayo operation, where the forceps is forced through the inguinal canal at the risk of injury to the nerves in the canal, which we all know may to some extent embarrass the patient later on.

As for the results of the operation, they are quite as good temporarily as any of the others. For myself I should prefer the Franklin H. Martin operation in all cases in which the abdomen is not necessarily opened. It is the most reliable, the most successful, and not only successful, but it has good philosophical reasons for being successful in the fact that the ligament has to extend from the inner ring across under the skin to the spine of the pubic bone of the opposite side. Dr. Byford's operation necessitates opening the abdomen, and hence is applicable only when the other surgery is required than that for simple retrodisplacement of the uterus.

Dr. John G. Clark.—I rise to ask a question as to a historical point. Dr. Schenck in his discussion alluded to the

Mayo operation. My impression has been that what is commonly called the Mayo operation should be credited to Dr. Simpson. I hope Dr. Simpson in discussing Dr. Byford's paper will point out whether there are any differences between the method which he has proposed and the one often spoken of as the Mayo operation.

Dr. F. F. Simpson.—I should like to refer, first, to a very common error which leads to confusion with regard to the different types of operation. Retroperitoneal shortening of the round ligaments is often spoken of as the internal Alexander operation and as a modified Gilliam operation. It is neither an internal Alexander nor a modified Gilliam. The essential feature of the Alexander operation is that the peritoneal cavity shall not be opened. I have a copy of that reference before me. The essential feature of the Gilliam operation is that it should draw the round ligaments directly across the free peritoneal cavity, leaving two bands stretching across the peritoneal cavity, beneath which an intestine might slip and become strangulated. That seemed to a great many men to be an unsurgical procedure, and at a meeting of the Southern Surgical and Gynecological Association in Cincinnati, in 1902, there were three papers read which described methods of intra-abdominal but retroperitoneal shortening of the round ligaments. These operations shortened the ligaments by drawing them forward, but they were essentially different from the Gilliam and earlier Ferguson operations, in that the shortening took place beneath the parietal peritoneum. Nature originally placed the round ligaments beneath the parietal peritoneum, and it seems wise to imitate her in shortening them. The three papers to which I refer were read by the late Dr. Alexander Hugh Ferguson, of Chicago, Dr. Goerge H. Noble, of Atlanta, and by the sepaker. I stated in my original paper that the essential principles are (1) that the ligaments should be drawn forward; (2) that they should be shortened; (3) that the shortening should be effected beneath the parietal peritoneum. The latter constitutes an essential difference between this and all other types of operations. I further stated at the time that there would be various modifications in minor details of technique. During the next few years there were about sixty slight modifications, none of which embodied a new principle.

As to the results of the retroperitoneal shortening of the round

ligaments, in 1910, for the meeting of the American Medical Association I reviewed the results in something over 400 of my operations. This review consisted in an analysis of the findings in about 300 of these patients who were examined by me or by their family physicians within a few weeks before the meeting. Of that number the uterus was in forward position in 98 per cent. of the cases. There were 2 per cent. of failures. The failures occurred in the class of cases referred to by Dr. Reynolds this morning, the cases in which the bladder was attached low on the cervix and drew the cervix forward, the high attachment of the sacro-uterine ligaments drawing the fundus backward. We had not up to that time recognized this as an important factor in the cause of displacements and did not displace the bladder upward to change the leverage. I believe today a larger percentage should remain in normal position.

Following pregnancy—and there were forty-five cases in the eight years—the round ligaments thus shortened followed identically the course of ligaments which had never been stretched. They were elongated normally during the course of pregnancy and when the uterus emptied itself, it quickly contracted out of proportion to the contraction of the ligaments. Normally the ligaments at the end of labor are always long enough to permit the uterus to drop into the hollow of the sacrum whether the ligaments have been previously stretched or not. The same thing was true in those who had been operated on by me. Only one patient required a second operation. It was rendered necessary by a failure on the part of the patient to carry out instructions. If the obstetrician permits the uterus to remain in the hollow of the sacrum during the puerperium the ligaments will not contract strongly enough to draw it forward and they will remain permanently too long whether they have previously been stretched or not or shortened or not. By recognizing that fact and by keeping the uterus in the natural position for a few months after delivery I believe the vast majority of cases of retroversion following delivery will be prevented.

Dr. J. Wesley Bovée.—I want to utter a word of caution regarding this procedure, and it is this: There are three points that should be guarded against in the procedure in this portion of the abdominal wall: (1) making the opening too small to draw the ligament through there is danger of the constriction of the connective tissue immediately adjoining the serious layer

which may constrict the ligament to the extent of lessening markedly its nourishment and its pulling power; (2) in there being a little too large an opening with an eversion, that is the turning out of a raw surface toward the peritoneum to which adhesions may take place about the ligaments; (3) the danger of trouble in causing separation of the peritoneum from from the extraperitoneal tissue.

Dr. Henry T. Byford.—With regard to the difference between the Gilliam type of operation and this method, the new attachment is not so far out laterally toward the internal inguinal ring as in this one.

Speaking of the objection that there may be trouble from such free separation of the peritoneum, I made a mistake once that was very instructive. The patient had been operated upon before, and expecting to find adhesions of the intestines, I was so careful about keeping out of the intestines that I did not get into the peritoneal cavity at first, but separated the peritoneum extensively on both sides from the abdominal walls. When I discovered my mistake I noticed that there was almost no bleeding. I then opened the peritoneal cavity and finished my operation, and the patient had an unusually smooth recovery. After the incision was closed the abdominal pressure kept the peritoneum against the abdominal walls so firmly that no separation of the surfaces nor oozing of blood could take place.

With regard to the constriction of the ligament through a small peritoneal opening, I will say that as the connective tissue down in the region of the bladder is very loose, I make the puncture just as fine as I can and want the peritoneum to cling around the ligament, knowing it cannot constrict it. A large puncture might allow some oozing from its loose edge into the peritoneal cavity.

With reference to what has been said concerning one method for all cases, I am not advising this for every case, but in those only in which the abdomen is opened and the conditions favorable.

THE NEW "EFFICIENCY" SYSTEMS AND THEIR BEARING ON GYNECOLOGICAL DIAGNOSIS

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Summary. Should the methods of Taylor's "scientific management" prove adaptable to health factories, as, for example, in dispensary and hospital and office group-diagnosis, then responsibilities would be recast by "function;" processes would be standardized, and reduced to writing; instruction carried throughout; inspection check up everyone's results, and the whole be preceded and constantly accompanied by detail studies of time and waste, motion and fatigue. An outline of an interview with Mr. Frank Gilbreth is given, with a chart of functions. Suggested standards are listed and examples of printed forms submitted, such as a full preliminary history to be made out by the patient herself, and directions to gravida, and to women at forty. Reference is made to coöperative methods as instanced in the Associated Out-patient Clinics of New York; in the plans of the Hospital Efficiency Committee of the Philadelphia County Medical Society representing fifty-five hospitals; in the great Mayo building recently opened; and in associations of doctors in groups in cities great and small.

As far as part of our manufacturing goes—the turning out of a high average in our primary or basic product, a diag-

nosis—the work is still in the home industry or village stage. In the Bavarian Highlands the household undertakes the manufacture of one toy, or part of a toy, the next part being made down the street. In simple articles this is effective, individual, of low cost, and may be better than the output of the cheap factory. The best of it, the artist-craftsman's work, brings satisfaction only, however, when one can afford to disregard the relatively high cost of such necessarily slow production. In like manner the fully equipped clinician who is at home in laboratory technique may, for instance, run over his blood, urine, feces, sputum, eye-ground, reflexes, and fluoroscope screen and check up conclusions, especially in a puzzling problem. But this high-priced labor cannot do routine *diener* work, neither cut sections, nor develop plates, and if one man did handle all detail he yet could not dispense with the need for an average complete diagnosis, by two or three well-qualified specialists. Even though he find the cause of the pain, and rest satisfied with relieving it, he cannot say that it is the only contributing cause or that there is nothing else the matter, unless his patient is fully overhauled. When my motor goes into the shop to be partly taken down for a fault I don't want other defects overlooked.

If our office diagnosis then may be said still to represent the home-above-the-shop period of industry, most dispensaries may not unfairly be called cheap factories, as far as thoroughness and highly finished product is concerned. We have profound regard for the finest of these institutions and for the weary years of devoted work of those who serve in all of them. We could hardly put forth better results under present conditions. It is not that the labor is underpaid. It is unpaid. The apprentice work of the young doctor is not only junior work, but it is the labor of the partly trained craftsman with rarely the master workman

(professor or chief) to drill him, and with no inspector going the rounds to check up results regularly. The tools in this workshop have been known to be discards from the operating rooms above, and the light of a basement must often suffice. In other words, neither state, nor city, nor private patient, as the run of these goes, appreciates the complexity, or thinks he need pay for, a complete diagnosis. Yet treatment is dovetailed with diagnosis in all these matters and rises or falls down with it.

What is the remedy? Coöperation. The brighter side of the picture shows it.

There are four agencies outfitted for real diagnosis:

1. The well-equipped hospitals and dispensaries of the leading medical colleges. As compared with these, the very best hospitals not connected with teaching institutions rarely do thorough work, even though provided with a full staff of specialists. Attendance in free wards is a gift of time by busy men who have to steal it from the needs of earning a living. It cannot, therefore, be their first business in life, nor yield a product of anything like uniform excellence. In a lesser degree this holds good of dispensaries.

2. A well-organized clinic like that in Rochester.

3. The team play in those smaller towns where the medical men have studied the need, allotted their several parts, sent away the different members of the group each to train in his own line, and meanwhile conserved his practice for him.

4. Group diagnosis by an association of men in the various lines of medical work, in a building adapted for the purpose. This may be in hospital, office structure, or dispensary. In some institutions like the Johns Hopkins and the Peter Bent Brigham, members of the staff send in patients who can pay but a moderate fee to stay for a few days, and the staff is turned loose on them for careful study. Any dis-

pensary might use some of the hours when the plant is lying idle and run it for the neglected class, the self-respecting people of small incomes. It is an axiom that the poor get a degree of group diagnosis in dispensaries, while the rich get it by reference from one specialist to another; but the "backbone of the nation" is badly off in its wandering from practitioner to practitioner. A plural diagnosis for a moderate fee in a dispensary put to use in empty hours need not cause an outcry that patients are being stolen from the family doctor if the provision is made that only referred cases will be accepted. Anyway, some such action is inevitable.

In speaking of a group in an office building I do not refer to such a development as that on Chicago's finest avenue. The famous and able men there have facilities on a floor of this handsome edifice for little more than taking histories and distributing patients to hospitals. On a recent visit there no *x*-ray or fluoroscope outfit or laboratory or surgical dressing-room or examining-room worthy the name were seen. A gynecologist of big fees had not even an office nurse. Two men divided a little office or even a single desk. It looks like medicine as commerce raised to the *n*th power. Or else such offices frankly give up diagnosis and send every patient to the hospital, which has its points.

At the other extreme is the new clinic of the Mayos, opened in March. In a dignified building of six stories something over two hundred feet square, with the same beauty of interior and quiet taste that the brothers show in their own homes, Dr. Plummer has spent nearly $500,000 on a structure without its equal for completeness. The clinics of a city like Vienna could do this work. But the difference lies in this—here is correlation, there rivalry. In this institution 125 people are employed, 68 of whom are

doctors under salary. They took care of 20,000 new patients in 1913. This organization has been called the longest step toward making medicine an exact science that has yet been taken. It is strange that it should come from private enterprise and not from the schools. For this is not only a great place for diagnosis and for surgical treatment, but for research. Six thousand dozen *x*-ray plates were ordered in a year; here is a great museum; with eight fellowships; with an entire floor given up to an animal house; its several animal operating-rooms offering facilities to any well-accredited person; a forty-acre farm raising 1000 dogs a year—dogs that have never been anyone's pets. Data are gathered from an enormous material with an exactness that is Teutonic in its patience and American in its systematizing and labor-saving. Here is coördination and a real study to eliminate waste effort, from which all dispensaries may learn. These men have travelled. Every twelfth month and fifth year each doctor must be at the business of seeing other men at work in his own line and studying to perfect himself. The rest days are allotted as scrupulously as the work hours. Withal the human element is not lacking. No men could be more approachable, more kindly than the brothers Mayo, with all their true dignity. On the dispensary benches they are known affectionately as "Will" and "Charley." The benignity of Dr. Graham, the leading clinician, the compelling eye-twinkle of Dr. Wilson, the pathologist, and his contagious enthusiasm; the freedom from pomposity, professionalism, and secretiveness in this atmosphere is a thing to feel and to go far to see. The evening meetings where each brings his travel experience or his reading; the follow-up by which the *x*-ray man sees the stones of which he cast the shadow, or the cystoscopist views the interior of the bladder he pictured; the planned scheme of promotion and change of work;

the fair price for fair work; all these things are worthy of our study as well. And, big as it is, the human touch is not the least of its attainments.

There may be, there doubtless are, shadows on this bright picture. A case cared for by an intelligent and well-trained man in any of our great cities with the assistance that he can command will yield an individual product more finished, more perfect, more personally studied than the best Ford factory in the world in the way of a clinic can produce. But this detailed costly individual study is impossible for the majority of people. Wholesale work done with the utmost thoroughness and conscientiousness has got to be carried through for crowded, suffering humanity. Before we criticise it is up to us, with our great city opportunities, to combine and produce results as good or better, even if it be only a clearing-house for medical failures of our own section. Rochester has nothing on us in craftsmanship, in skill, in ability. But in far-sightedness, in simple directness, in that alert team play that sinks the individual in the good of the group; in keenness to go out and get and bring back the latest and best from every possible source, I think it may well challenge any other institution in medical science today. As Dr. Will Mayo says, this thing can work itself out in but two ways, either the State must take over medicine, as it has made a start to do in England, or else through private agencies coöperation must come.

The ideal office building would be close to or connected with a hospital so that gas anesthesia for examination or minor operations would be feasible and a chance provided for rest to recover from painful or disturbing experiences. Or it should have a bed or two. Resident nurse and doctor are presupposed, as it is a centre where medical aid is always to be had. Its laboratory equipment will be complete and ready for emergencies, like blood counts or the autogenous

vaccines that call for a resident pathologist. A Roentgen equipment is at hand. An operating-room for minor surgery and dressings, with sterilizing rooms; dark-rooms for eye, throat, and bladder work, and photography; hot-air apparatus, and electro- and hydrotherapy, massage, and body building; all these are to be carefully thought out. The staff might be so developed that a representative of any of the leading specialties would be found at any hour in the morning or afternoon, and also in an evening shift. And the business manager would investigate credits, follow up delinquents and run the building under the self-governing medical staff.

One thing is fundamental. Too mechanical and cold-blooded a process in this human and humane work will not succeed. In any group-work some one man has got to be responsible for and wholly interested in the particular individual and see that all necessary steps are followed through, the conclusions summarized, the results clearly stated to the patient. Always one there must be to say to the others, "Search; report; leave to me to interpret, to apply." Theoretically this would be the medical man, the internist, the clinician. Practically it will be probably either the one who starts the patient round the circle or the one in whose department the chief trouble lies.

Another thing is clear: The division of a very moderate diagnosis fee into several parts involves no small amount of good-will, with the allotment of a larger proportion to the medical man than he now averages. Starvation returns are driving strong men away from medicine. The group must take care to develop this department to due proportion and import.

Plans of Office and Dispensary have been studied in two previous papers, one concerning the individual office

with multiple small rooms[1] and one describing the carefully planned gynecological section of the dispensary of Brooklyn Hospital.[2] These make for the essentials in work in our department—thoroughness, privacy, expedition. I know of no other dispensary wherein exists a dressing cabinet in a separate room for each examination, with a recovery-room, and ample nursing service. With four tables there is no wait while a patient is loosening her clothing or putting it on, for novocain to take effect, or for a patient to be gotten ready for treatment.

Dispensary Coöperation. To coördinate and standardize dispensary work the out-patient clinics of New York (and also Brooklyn) organized under the title "The Associated Out-patient Clinics of the City of New York," with an office at 17 West Forty-third Street, with Dr. S. S. Goldwater as Secretary, and Dr. Le Roy Broun as one of the members of the Executive Committee. Their general aims are: coördination; the study of the sources of cases, of districting, and of the specialist dispensaries; the elimination of unworthy applicants, either by individual investigation or through a central bureau; the promotion of proper standards; the limitation of the number of patients to the facilities provided in a given institution; the overlooking of its equipment; study of social service to prevent overlapping and unnecessarily long trips; the hours of physicians; results of paid and unpaid worker; costs; nominal fees; and economy and efficiency in general. Recommendations for rules for venereal disease clinics were prepared, and in many cases adopted; and various authoritative

[1] Dickinson, System and Expedition in Office Practice, Office Plans, and Details, Med. Rec., May 6, 1905.

[2] Dickinson, The Organization and Working of a Unified Gyncological and Obstetrical Department at Brooklyn Hospital, Long Island Medical Journal, 1914.

opinions obtained and circulated. The section on gynecology, which has upon it of our members Drs. Boldt, Broun, Frank, and Studdiford, is headed by Dr. Oastler. It made a study of organization, equipment, and administration of gynecological out-patient departments and drafted recommendations as well as forms of history cards and cards of instructions to patients. For instance, they advise: That the number of patients should be limited in accordance with the facilities in men and equipment of each clinic; that an average of six patients, old and new, per table per hour be adopted. That female syphilitics be referred to the department of syphilography or dermatology, but that children with vaginitis be retained. A gonorrhea card and a cancer card were issued.

Other efficiency engineers beside those mentioned have attacked our problem. Mr. Richard Waterman is the Secretary of the Committee on Hospital Efficiency of the Philadelphia County Medical Society. Its report is to be had from the chairman, Dr. Edward Martin, 1506 Locust Street. It has taken up with the fifty-five hospitals of that city the questions of uniform accounting; of coöperative social service; of end-result studies. It calls for conferences by the appointment from each hospital of an "efficiency committee" made up of the superintendent, a member of the lay governing board, and a member of the professional staff. It has under way the study of the whole situation.

How to Start Scientific Management in Hospitals. In a talk with Mr. Gilbreth, in February, I asked him how he would go about the study of our problems. Although he was speaking of the hospital problem in general his answer would apply to a dispensary organization. "The ideal way," he said, "would be a demonstration hospital, but, until one is started, any institution could do these things: (1) Lay out a form for making a record; (2) record

the present practice in minutest detail; (3) examine the data thus gained; (4) organize a planning department; (5) adapt the plan of carefully separated functions, with their functional foremen, to your special needs.

"With regard to the study of detail, make stereoscopic pictures of everything. No detail is too small to write down. Trace the route of a pill from the manufacturer until it goes down the patient's throat. Make the most painstaking statement of every single item of outfit and action. A doctor should be assigned to the engineer who would do this, taking, if necessary, two years and making *Century Dictionary* sized volumes.

"As to the examination of the data," he went on, "it is astonishing how just the laying bare of cold facts will be enough to reform and abolish no small proportion of the things that are wrong. Most institutions boggle at the proposal to make this kind of record. They are afraid of it. Most surgeons resent it, refuse it. But this is the way to better things, to chart every break in technique, stick it up, be public about it; and cure results.

"In the matter of the planning department," he said, "ask any institution for its chart. It looks foolish. It hasn't any chart."

He showed the chart of a factory organization and commented on it. "There would have to be some alterations to fit this class of institution. For instance there would be no speed boss. In place of a gang boss would be a teacher. There would be a repair man. There would be an inspector, who would be a very important part of the organization. His work would be not so much investigation as prevention. Investigation is the finding out of trouble after it happens. Inspection is the keeping of everything up to the mark so that trouble does not happen. One might be said to be postmortem, the work of the pathologist. The other might

be said to be preventive medicine. This man need not be a medical man. He is the checker-up and is not the man who punishes or disciplines, for when he finds something going wrong, such as a nurse dropping gauze on the floor on her way to do a dressing or making unsafe contacts, it is he who reports to the disciplinarian. All breaks, all technical errors of whatever kind are entered by him. If a surgeon makes a fault in technique it is entered without malice and without any other idea than that of checking up. Publicity about this list of errors is the great way of stopping trouble.

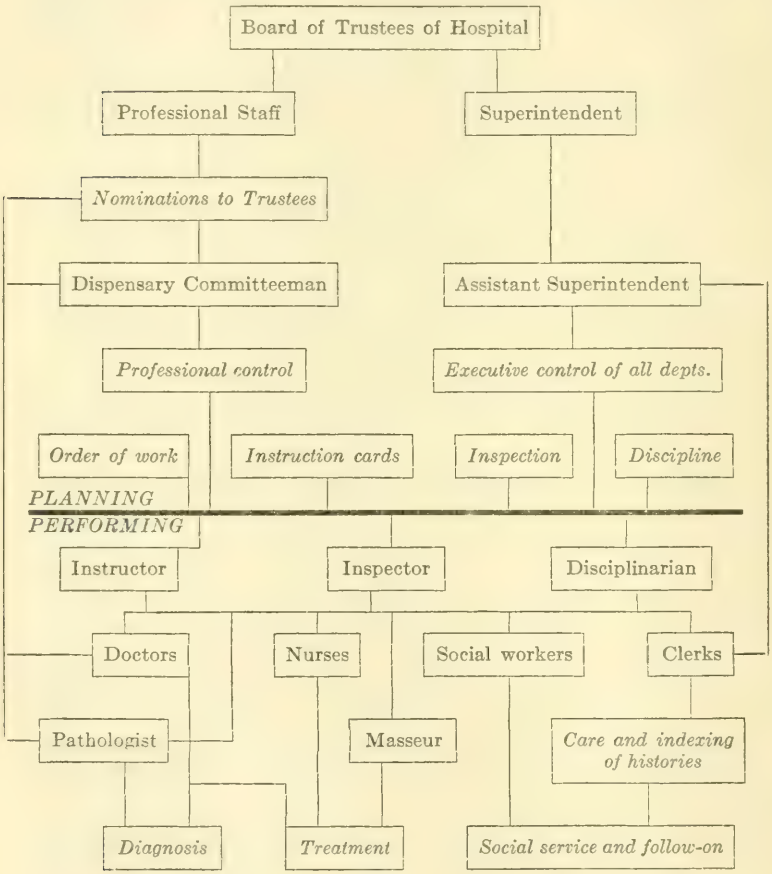
"The disciplinarian is the man who decides all the questions bearing upon faults made. His activity is not that of bouncer in general as the word suggests. A workman may commit several faults. Under the old regime it was three times and out. Then he was bounced and a new man put in who was allowed to make four errors and then he was bounced, and he too went off and got another job. Under the new way when the first man has made errors, one, two, three, he is every time gently but persistently corrected and that correction continues until he ceases to make that particular error.

"As far as possible all activities are charted in a peak and valley drawing. These peaks and valleys give us the clue to the high and low points of all our work and we proceed upon these clear indications.

"Be simple, use few tools. Imagine yourself operating out under a tree. Hunt out the best experience, measure it, make it standard; write it down on an instruction card. Above all, get your people thinking in terms of elementary motions."

And here is an attempt—a maiden attempt—to embody his ideas in our dispensary work. The application to hospital work will be taken up in a paper at the meeting of the American Medical Association in June.

A Chart of the Functions of Scientific Management in a Dispensary.
(*Suggested by Gilbreth*) (*Drawn by Dickinson*)



STANDARDS. We all admit that there is a best way of doing any particular thing. This best way is susceptible of determination by time-study, motion-study, and result-study. Once determined it may well be adopted as the standard at that time. Next month or next year a better way may be found. Until it is, the chosen standard remains. Meanwhile experiment to discover the best way is welcomed, and a reward allotted for successful ideas. Mr. Gilbreth declared that he finds surgeons impatient of talk of standards and incredulous of their being effective, and slow to submit to test of their opinions. To this I answered that I thought surgeons did not themselves appreciate how far they had already gone in this direction; namely, in the overcoming of mere tradition and rule of thumb by elaborate series of tryouts and by written rule.

Among the matters affecting gynecological diagnosis that are susceptible of standardization I may schedule the following:

1. History.

(*a*) Form of blank to be filled out by patient.

(*b*) Form of blank to be filled out by doctor.

(*c*) Official nomenclature of diseases (Bellevue or International Classification of Causes of Death, or Nomenclature of Diseases of the Royal College of Physicians).

(*d*) Diagrams or rubber stamps bearing definite relation to average normal measurements.

(*e*) Blank form for statement of diagnosis (presumptive or positive) to be given to patient.

2. Plans of rooms; in office, in dispensary, in hospital, in office building; lighting; darkening for artificial light; sound-proofing; water closet; sterilizer; convenient placing of instruments yet out of sight of patient; dressing rooms; privacy; etc.

3. Personnel; examiner, assistant, nurses, accountant, stenographer (dictaphone, dictagraph), telephone and door attendant; presence of third person at examination, etc.

Consultant; clinician, neurologist, orthopedist, gastro-enterologist, syphilographer, and others.

4. Outfit; table, tilting for Trendelenburg and Sims; headlight; instruments; cautery; proctoscope; gloves for certain cases or all; etc.

5. Procedure; amount of sterilizing of instruments; minimum requirement; preparation of patient (emptying bladder, extent of undressing, prevention of exposure); order of examination.

6. Speed. Number of patients an hour, for old patients; for new patients.

7. Instruction cards. (*a*) To assistants about procedure; (*b*) to nurses; lists of instruments; orders about sterilizing, glove cleaning, preparation of patient, etc.; (*c*) to patients.

8. Reports of work done; of results.

9. Follow-on and social service work.

Is your office standardized? Mine is not. But while writing this I see some of the things I need to do.

Instruction Cards. A large field exists for specific and detailed information to be given to patients. Among other cards in use in my office I give two as bearing on our title.

In the pregnant woman the diagnosis of miscarriage, tubal gestation, toxemia, placenta previa, and premature labor soon enough for prompt action that may avert serious trouble, will be enormously facilitated by printed instructions. In this way only can cancer be detected sufficiently early to be helped.

CARE DURING PREGNANCY (ON CARDS 3 AND 5).

Lead a wholesome, simple life. Fresh air for two.

1. MISCARRIAGE most commonly occurs at the time when one of the first three periods would be due. For a week at each date guard against muscular strains, overtire, intense emotion, keeping mostly to couch and wrapper then, avoiding trolley, carriage, auto, husband, hard work, social functions, shopping, sewing machine, and any laxative (but enema allowed). Quinin, aspirin, salicin, strychnin, by direction only. If pains or flow begin take M. S. tablet, go to bed, notify doctor. Marked tendency to miscarry may necessitate continuance of these precautions most of the time until the fourth month. Backward displacement and forward bend of the womb cause many miscarriages; either may be present without pain at periods; therefore internal examination is desirable in every pregnancy just before or after the second omitted period. Do not fear "marking;" maternal impressions are a myth.

2. CLOTHING should be adapted to meet the individual need of warmth, and avoid pressure at the waist line. A maternity corset or belt may be needed after the fifth month.

3. EXERCISE is important, and hours out of doors; a brisk walk is followed by rest. Heavy strain is forbidden, but lifting arms above the head can do no harm. Permission needed for travel or motoring. Avoid overtire. Break the day by lying down twice. To bed early.

4. DIET is to be simple, wholesome. Food between meals may relieve nausea and faintness, and improve nutrition. Individual tendency to obesity and muscular sluggishness must be combated. If meat needs to be cut down for certain indications or starchy or sugary food restricted, the doctor will instruct you. The teeth call for especial watchfulness.

5. CONSTIPATION is met by diet, exercise, and a fixed hour for going to closet. Black coffee on awaking; cold water twenty minutes later; meat once daily; raw fruit twice daily; stewed fruit, such as prunes, apricots, rhubarb, once daily; green vegetables and salads freely; olives, celery, and sweet pickles (unless these disagree)—some or all of the above. With relaxed abdominal walls, corset or belt may help; or posture, such as squatting, forward bending, or upright sitting, during the movement. Failure by bedtime calls for an enema of 1½ pints of lukewarm soapsuds. Continued constipation should be reported.

For heartburn ½ teaspoonful sodium bicarbonate in ½ tumbler of water.

6. URINE is to be sent on the first (and fifteenth) of each month after the ..... month. First passed in morning, 4 to 6 ounces, labeled with name, sent early to office. Before passing sample, wash the parts. If specimen cannot be sent, boil sample in tablespoon and report if it clouds.

7. Breasts. The nipple should be developed to insensitive india-rubber—not tanned leather. Begin at the fifth month with five to ten minutes daily massage, pulling outward with pulps of three fingers or by cupping glass (three-fourth to 1 inch opening, with rubber bulb), intermitting if tenderness develops. To remove tiny dry scales, once or twice weekly smear on lanolin at night and lather in the morning.

In the last three months the stretching skin of the lower abdomen should have oil rubbed in at night.

8. Report at once any flow of blood, abdominal pain, urine below one quart a day, repeated headache, dizziness, dullness of sight, swelling of legs or face. Visit or report is made once a month, with examination six to four weeks preceding full time. Consult early with the doctor concerning engagement of nurse, and refer summer location. No vaginal douche unless ordered, and then warm only. Intercourse inadvisable after sixth month. Refuse to listen to depressing experiences. Question doctor and nurse freely. When in doubt telephone.

Cancer of the Womb—What Every Woman Should Know to Protect Herself.

1. Cancer is at first a local disease, commencing as a small spot.

2. Hence the great importance of detecting cancer of the womb at its very beginning.

3. There are no infallible signs of the onset of the disease, but there are symptoms which are suggestive and which should lead the woman to consult reliable medical authority.

4. The most important of these is a bloody or a blood-tinged discharge occurring at other times than the monthly period. This staining or spotting may be brought on by exertion, or such contacts as the approach of the husband, or the introduction of the syringe nozzle. At the change of life any thin, pale, watery or malodorous persistent discharge, even without blood-spotting, must be regarded with suspicion.

5. Any marked difference in the monthly period of a woman, at any time of life, demands examination, and particularly if it occurs at the time of the change of life.

6. The natural occurrence at the change of life is a lessening of the flow, with longer intervals between the periods, until they cease entirely. Hence any increase in the amount of the flow or any increase in its frequency demands the most careful investigation. A harmful error is common among women, and is even shared by not a few physicians. It is thought that the change of life is naturally accompanied by excessive flow at the monthly periods, and that a flow even between the periods may be unimportant. Such an opinion is totally wrong.

7. This excessive bloody flow, or too frequent flow, or a discharge, does not always mean cancer. It may be due to other causes. A complete internal examination usually shows the cause. If it does not a

scraping and a microscopical examination of these scrapings or a bit of the so-called ulceration of the neck of the womb will settle the question. Any statement, even by a physician, that irregular flow has no significance should not be heeded unless based on *complete* examination.

8. Pain and loss of flesh and strength are not early symptoms. They may not even be present when the disease is well advanced.

9. The actual cause of cancer is still unknown. But it is known that local irritation constantly kept up may lead to the development of cancer. Hence a woman should not neglect the injuries or tears of childbirth, nor any local disorder of her generative organs, and as she reaches the age of forty should make sure that she is in good local condition.

10. The most common age for cancer to develop is between forty and fifty years, but cancer of the womb may occur at any age.

11. Thus far the only reliable treatment for cancer is operation, but in order that the operation may be attended with the best results *it must be done early.*

12. Once again. Cancer is at first a local disease. Everything depends upon recognizing its beginning.

Preliminary History. Maximum thoroughness with minimum labor on the part of the doctor is effected by providing a new patient with a blank to fill out. Insurance companies have long furnished standard history outlines for the applicant to fill up. For years Madison Taylor has urged self-records and full data, and from him my sheet is largely borrowed. That infective genius Plummer, of the Mayo clinic, has a plan of reducing histories to a mathematical basis, compactable, with countable factors, by the use of standard forms, letters, or numbers for each item, a sheet for each department's history, and a second for its summary. He told me in February that he had not a gynecological sheet. On his goitre sheet symptomatology is elaborately scheduled; elsewhere he merely prints a heading "subjective symptoms."

A preliminary history sheet like the sample I submit may be used in one of several ways.

1. The man beginning practice may fill it out himself or else regard it as a mere question sheet to train himself in orderly procedure.

2. With impatient people in line the filling of this sheet, on a board clip, may beguile the waiting of the new patient, if she has sufficient intelligence to have it given to her.

3. The man who sees patients by appointment has his secretary or nurse mail a copy to the prospective patient. Then, brought in by the patient, it may either be filed by those who use letter-filing devices for their histories, the relevant items red-lined, or the important data summarized on whatever card or book one prefers. In any case it shortens and systematizes case-recording even though it increases bulk. The mischance is avoided of overlooking such things as a fistula or gall-stones, or a family history of early deaths and bleeding habits. Patients are encouraged to keep health records. Furthermore, if we do as patients or their relatives have a right to ask of us—and eventually they will have the sense to require it—if we give in writing the presumptive diagnosis or the findings and procedure at operation, or the outline of treatment to add to this sheet, then we shall be making histories of some value, and not until then. Simpson has started something of this kind. And in the office on Utopia Avenue our lady of the future will walk in at her first introduction carrying her loose leaf book in her hand, the book that is an index to her insides. As it is at present only the man who has cut the leaves knows the contents and most people have very vague ideas of just what was done for them when they were under ether.

The only way I know to perfect a plan like this is to keep it in actual operation for a length of time and so, developing its defects, improve and standardize. Each different specialty would put the emphasis in a different place, and need a different form.

Though the public believes that we have some magic of intuition we ourselves know from sad experience that diagnosis is as patient an accumulation of a multitude of facts as Burns has shown detective work to be. A study of lives, a study of all organs, a record in order, a record in great detail—this is the line of progress.

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PRELIMINARY CLINICAL HISTORY.

Gynecology—Obstetrics

To be made out by the patient or family; the whole blank being looked over before any answers are written.

It is suggested that the second copy be filled out and kept by the patient as a part of her health record.

A good outline that covers both health and ill health, set down in proper order and sequence, filled in when one has leisure to search the memory for half forgotten facts, may exert an important influence in solving problems of diagnosis and treatment. Matters that appear to have no bearing on the present trouble are sometimes of material significance. The space following a question is often insufficient for adequate answer. On a blank sheet, preferably of about this size, one would answer, starting with the number that corresponds with the question. Words needed for answers may be underscored (except under Family History) especially main symptoms. Help is to be asked of the doctor about questions that are not clearly understood.

Date.....

Name, Miss, Mrs.....Husband's name.....

Age.....Birthplace.....of Father.....of Mother.....

Occupation.....Address in town.....

Telephone.....Address out of town.....

1. Chief Distress or Disturbance. What *symptoms* bring you to the doctor .....

.....(3 blank lines here).....

2. Family History. Occurrence among grandparents, father, mother, uncles, aunts, brothers, sisters, and children, of consumption, cancer, invalidism, obesity, hemophilia ("bleeders"), diabetes, gout, rheumatism, nervous prostration, mental defects or derangement, epilepsy, paralysis, alcoholism, and general tendency to vigor or lack of vigor. Note also whether family is long lived or not, and which parent one "takes after." Write below.

.....(7 blank lines here).....

3. **Personal History.** First give **in outline** here, then in detail further on under proper sections. State in actual sequence or order, with year or age as near as may be, any illnesses, weaknesses, accidents, falls, injuries, labors, miscarriages, operations. Name of doctor with each.....

.....

.....

.....(12 blank lines here).....

.....

.....

4. **General Health.** As child, vigorous, fair, delicate, poor, bad, often ill. As young girl.....

After periods began.....Since marriage.....

Since childbirth.....Since operation.....

.....

.....

What is your present state of health as to strength, activity, weakness.....

.....(first page ends here).....

Average weight.....lb. lowest, and when.....highest and when.....

Any long weight loss.....Any surroundings that have affected your health.....

.....

.....(may be condensed here).....

.....

Under what conditions health at its best.....

.....

5. **Occupation and Habits.** Childhood in town, country; long, short country vacations.....
School until.....college.....health at school.....at college.....
.....
Gymnasium and sports at school or college.....
Outdoor life and habits, special expertness in athletics.....
Have you disliked vigorous exercise, or been unable to take it.....
Given it up.....Favorite recreation, hobby or play.....
Fresh air habits.....wide open window at night.....
Oversensitiveness to cold.....thick or thin underclothes in winter.....
Dependent upon corsets.....Backache without them.....Work done without them.....Ready made or to order .....
.....
Bathing habits.....
Nature of work formerly and now.....
.....
Enforced sitting.....standing.....fatigue.....
Number of hours at work.....work at home.....
House work.....
Average vacation, summer only, scattered thro year.....summer housekeeping.....
How many cups of coffee a day.....of tea.....any alcohol.....morphine ever.....
Sleeping medicines.....bromide, much.....tonics.....
.....
Any unpleasant peculiar effect from special food or medicines.....

6. **Eyes.** Any examination.....what diagnosis.....by whom.....
Were glasses ordered.....was headache said to be due to eye strain.....and relieved.....
Are you wearing them.....eyes ever protruding.....
.....
7. **Throat, Nose, Ears, Chest.** Frequent sore thorat.....tonsillitis or quinsy often.....
Hay fever.....asthma.....bronchitis.....frequent colds.....loss of voice.....
Frequent very prolonged cough and when.....ever spitting blood.....
Pneumonia.....pleurisy.....tuberculosis.....under what doctors.....
Ever persistent elevation of temperature.....Prominence or enlargement of neck, or of glands of neck.....
.....
.....
8. **Heart and Blood Vessels.** Have you had any disorder of the heart, what was it called.....
When.....how long.....what doctor.....
.....
Rheumatism, muscular, in joints, slight, severe, in bed, how long, when .....
.....
Ever marked shortness of breath climbing stairs or hills.....
Fainting spells.....palpitation.....
Swelling of ankles.....hands and feet cold.....piles.....varicose veins of legs.....
Any tests of blood made.....of blood pressure.....
Anemia.....
.....(second page ends here).....

9. **Kidney and Bladder.** Ever said to be affected.....

Examinations of urine.....what result.....by whom.....when.....

.....

Puffiness of lower eyelids.....swelling of legs.....of whole body.....

Gravel, stone.....blood in urine.....painful urination.....

Frequent urination.....how often at night.....by day.....

.....

When did this begin.....when at its worst.....what doctors.....

.....

Kidney loose, movable, belt.....

10. **Skin.** In good order.....oversensitive.....good surface circulation.....

Perspiration, excessive.....skin dry.....pimples, where.....worse at periods.....

Redness of nose or face at periods.....eczema ever.....moles.....

Hives.....other rashes.....itchings of surface, where.....

.....

11. **Nervous System.** As child nervous.....serene.....St. Vitus dance (chorea).....

Any great nerve strain or breakdown, when, duration, treatment, sanitarium, worst features. Any shock.....

.....

.....

.....(6 blank lines here).....

.....

At present easily tired, easily exhausted.....

Headaches, frequent.....severe.....what part of head.....
Worse at period, only at period .....
Upper spinal aches.....neuritis.....numbness.....
Sleep, good, fair,.....poor.....to bed, what hour.....rise when.....
Frequency of loss of sleep.....from baby.....from society.....
Time of night wakeful.....
Convulsions.....hysterical.....when.....how often.....excitability.....
Loss of consciousness.....of control of speech.....of memory.....mental dulness.....
Ever much depressed in mind.....crying often.....losing interest in family and daily happenings.....
Ever given to apprehension.....of going out alone.....of sleeping alone.....
Irritability.....worry for insufficient causes.....
Special anxieties, big worries, financial, maternal, marital.....
Flushes began.....(dizziness).....
Backache began.....at its worst when.....whenever tired.....
Worse at period, only at period.....slight, severe, constant.....
In lower back on standing.....on turning in bed.....on stooping forward.....
12. **Digestion, Stomach, Bowels.** Teeth good.....good chewing teeth and opposite each other.....
Any pus about roots.....ever an abscess, bone abscess.....do you chew thoroughly.....
As child, digestion good, indifferent, poor.....in general how.....
Any serious trouble and when.....
.....
Nausea.....vomiting.....pain after food or on empty stomach.....distension (gas).....

Stomach contents ever examined.....by whom.....*X*-ray.....
Jaundice.....gall-stones.....appendicitis.....when.....
Treatment under whom.....operation.....
Rupture (hernia).....sagging of stomach, of bowels....(third page ends here).
Bowel Action formerly, recently. Give full history of constipation or looseness, and treatment, by diet, exercise, belt, medicine, enemas, whether bowel movement ever examined, by whom .....
.....
.....(3 blank lines here).....
Piles, fistula, fissure, treatment or operation.....
.....
.....obstinate itching.....
13. **Miscellaneous.** Spinal disease or curvature.....round-shouldered.....flat feet, painful.....
Difficulty in walking.....
.....
.....
14. **Menstruation, etc.** In childhood any leucorrhea, local irritation, bed wetting, accident to parts.....
.....
Periods began at.....year. In the earlier years regular; irregular; painful; profuse; scanty; long gaps; leucorrhea
.....(2 blank lines here).....
Flow is now usually normal, scanty, profuse.....number of thick guards soaked in whole period.....
Color bright, brown, pale.....clots, gushes, membrane.....
Regular every.....days. Irregular, from.....days to.....

Last period, date.....on time, late; character as usual, scanty.....

.....

Pain, dull, aching, cramp, drag, bearing down, slight, severe, constant, at intervals, lasting.....

Located in lower abdomen, in right, left groin, down thigh, in back.....

Began.....has increased, has been steady at periods since.....

Is present, is increased, before, during, after periods; worse from walking, working, bowel movement.....

.....

Leucorrhea, milk-white, yellow, clear; slight, free, only after periods: napkin or douche needed.....acute attack.....

.....persistent itching .....

15. **Marriage and Maternity.** Married.....years.....months, divorced.....living with husband.....

Number of children.....oldest.....youngest.....miscarriages.....

.....spontaneous.....last miscarriage.....

Operations after.....fever.....

.....

Labors, describe first especially, long, hard, not hard, instruments, stitches, complications, fever, slow recovery.....

.....

.....(8 blank lines here).....

16. **Amount of disability.** Cannot walk, cannot work at period, confined to bed.....hours.....days at period.....

Cannot work at all since.....

.....

Present illness or trouble began.....its supposed cause and history.....

.....(3 blank lines here).....

(The sheet is standard size for vertical filing, $8 \times 10\frac{1}{2}$ inches.)

A STUDY IN HOSPITAL EFFICIENCY AS REPRESENTED BY PRODUCT

By E. A. Codman, M.D.
Boston, Massachusetts

(By Invitation)

The object of this study is to give a practical illustration of the theory of hospital organization based upon an end-result system. This system, with its simple details, is set forth in the report of the Committee on Standardization of Hospitals presented before the Clinical Congress of Surgeons of North America, at its meeting November 10–15, 1913.[1]

We believe that all hospitals should have such reports, even, and perhaps especially, private hospitals. We believe that it is for the private hospitals to begin this publicity, as well as for the large, general institutions with national reputations. The reports of such large institutions would form minimum standards, and all private hospitals and small non-teaching hospitals should show much better results than the larger institutions.

We publish this study to show that it is possible for a private hospital to make such a report, and we believe that if a private hospital can thus expose its weaknesses, the public hospitals should certainly be able to do so.

[1] Surgery, Gynecology, and Obstetrics.

In the following report we have not in all cases attempted to follow the letter of the suggestions of the above-mentioned committee. If we had done so we should probably have had no readers, because a mere set of abstracted case histories would have been too dull even for a statistician.

We want to have this report read—partly because we are as proud of the cases from a mere surgical point of view as we usually are of the cases reported in our papers on special subjects, and partly because we want to illustrate a definite method by which the organization of a surgical service of a hospital can be based on the end-result system. We believe the same general method can be applied to other branches of clinical work besides surgery.

The idea is so simple as to seem childlike, but we find it ignored in all *charitable hospitals*, and very largely in private hospitals.

It is simply to follow the natural series of questions which any one asks in an individual case.

What was the matter?

Did they find it out beforehand?

Did the patient get entirely well?

If not—why not?

Was it the fault of the surgeon, the disease, or the patient?

What can we do to prevent similar failures in the future?

We believe that the general acceptance of a system of hospital organization based on the truthful record of the answers to these questions means the beginning of true clinical science.

The reader must not suppose that we recommend the publication of such criticisms as we have here inflicted on ourselves, or even recommend that the chiefs of surgical services should be so merciless to their juniors.

In this report we are proud to say that we have suppressed

nothing, but have given even the smallest details of lack of success. We are not afraid to do this, because we believe we have obtained as good results in these cases as any surgeons could have. To the layman who chances to read this paper, the fates of these cases may seem far better or far worse than his vague imaginations of the results of surgery, but we believe that few surgeons would say that they are excellent. Therefore, why should not the layman see them if he cares to? Why should he not look farther and study the reports of the large hospitals for himself, to learn where such and such a branch of surgery is well done?

In making our marginal symbols, with their accompanying criticisms, we have been hypercritical—and in fact have had to be, to find sufficient illustrations to show the points we wish to make! The absence of post-operative complications has made it difficult to make one of our chief points clear—that reduction of the number of surgical complications, such as sepsis, phlebitis, cystitis, etc., is one of the easiest ways of economizing hospital funds. Every patient-day lost in a charitable hospital by these complications should be multiplied by the daily per capita expense, and an account kept of the same. This amount can be greatly reduced by efficient organization.

To effect improvement, the first step is to admit and record the lack of perfection. The next step is to analyze the causes of failure and to determine whether these causes are controllable. We can then rationally set about effecting improvement by enforcing the control of those causes which we admit are controllable, and by directing study to methods of controlling those causes over which we now admit we have but little power.

A hospital which has an end-result system has an authoritative method of admitting and recording its failures in diagnosis and treatment.

The present paper deals with the analysis of the causes of

failure and the determination of the degree within which we can control these causes. We believe that the most difficult step has been taken when the staff of a hospital once agrees to admit and record the lack of perfection in the results of its treatment. Improvement is then sure to follow, for it often is the error of which we are ignorant that we persist in carrying with us.

To illustrate a practical method of making such an analysis, we have taken the results of our own private hospital for the first two years of its existence. These abstracts have been edited from the end-result cards in the way recommended. In a few of the more interesting cases (Cases 24 33, 42, 53, 55, 78, etc.) we have made quite a long abstract, partly to interest the reader and partly to show that many cases of great interest and importance would be conveniently placed at the disposal of science if such a system existed in the large hospitals. These unusual usual cases, if we may so call them, are now lost because surgeons are too busy to write them up. The rare cases of primary cancer of the Fallopian tube (Case 42), and the enormous distension of the common duct (Case 33), are unique in our experience; but, if we could skim through the abstracts of some of the large hospitals, we could no doubt make collections of such cases large enough for comparative study. It is the usualness of things which we think are unusual which often keeps us blind to important facts before our noses.

The reader must suppose himself the chief of a surgical service or a member of a hospital efficiency committee. The end-result cards of the week are before him. In a large hospital the chief of each service, at a certain hour, can have handed to him the end-result cards of all of his cases which have been discharged during the previous week, and also all returns brought in during that week by the follow-up system. A service of 60 beds can thus be easily reviewed in one hour a week. He must read them through and mark

in the margin of those cases which lack perfection the symbols indicated below. He may O. K. where he sees no flaw, and he may also graciously star the cases which he considers creditable. A key to the writer's reasons for criticism will be found on page 85.

To the thoughtful person it will be at once apparent that a chief of service who criticizes the results of his juniors or colleagues as exactly as we have done here would soon lose the *esprit de corps* which is necessary in successful work. Successful leadership always requires tact, whether the driving is done by criticism of the failures or by praise of the successes. To enthusiasm nothing is so deadening as to be ignored. To most men it is enough to know that the work is observed and measured, and if found of value will be appreciated.

If the chief has the gift of leadership he will praise here and condemn there, under any system of organization; but whatever the gifts of the chief, there must be a difference in systems, and it is our belief than an organization based on the consideration of the actual results accomplished must be better than one by which they are ignored.

All results of surgical treatment which lack perfection may be explained by one or more of the following causes:

Errors due to lack of technical knowledge or skill	E-s
Errors due to lack of surgical judgment	E-j
Errors due to lack of care or equipment	E-c
Errors due to lack of diagnostic skill	E-d
These are partially controllable by organization.	
The patient's enfeebled condition	P-c
The patient's unconquerable disease	P-d
The patient's refusal of treatment	P-r
These are partially controllable by public education.	
The calamities of surgery or those accidents and complications over which we have no known control	C
These should be acknowledged to ourselves and to the public, and study directed to their prevention.	

THE CASE REPORT FROM THE OPENING OF THE HOSPITAL IN AUGUST, 1911, TO AUGUST, 1913

Each case has a permanent number—no matter how many times he reënters the hospital. Each number will be abstracted once and succeeding reports will simply give the number and the statement of the condition of the patient at that date. When the death of the patient has once been announced, the number will merely be omitted from future reports.

Thus far no case has been refused admission because of the gravity of the condition or the critical character of the operation involved, although we by no means agree to take every case.

In three cases, No. 53, No. 55, and No. 146, feeling that the chance was desperate and speedy operation offered increased hope to the patient, we have called on Dr. C. A Porter for help, and his skill brought temporary relief where cure was impossible owing to the nature of the disease.

In one case we refused to operate on account of the desperate condition of the patient, and because our diagnosis was such that little hope was offered; we sent this patient home, believing that she could not live a week. (See Case No. 78.) Our diagnosis was wrong and the patient recovered.

The total number of cases corresponds to that of an active surgical service of sixty beds for one month. It would take the chief of such a service about as long to review his end-result cards at the end of the month as it would take him to review the cases here presented.

As a reward for this slight labor he would have the data at hand to point directly to every instance of serious lack of perfection in efficiency. Then—if he wishes—he can begin to ask questions.

There are two important words to be used in a report of this kind.

None—referring to complications—means that there literally were no complications such as local or general sepsis, phlebitis, cystitis, pulmonary conditions, burns from hot-water bottles, sinuses, secondary abscesses, or any other complication resulting directly from the operation or following it from other causes.

Well—referring to a result—means well, except so far as inevitable consequences of the operation are concerned, such as normal scars in abdominal operations, the absence of the limb after amputation, or the anesthesia inevitable after removal of the Gasserian ganglion. It should be qualified by a detail if sinuses, herniæ, painful scars, or other troublesome postoperative complications have occurred.

In the report of a charitable hospital the duration of the patient's stay should also be recorded, because this item is important in the study of the efficiency of the institution. No patient's stay should be prolonged unnecessarily in such institutions, because each day lost means a fraction less relief given to some other patient.

At the end of these abstracts will be found an illustration of an efficiency study.

CASE 1. Admitted Aug. 25, 1911. Male—35. Recurrent attacks of painful indigestion. Pre-operative diagnosis—duodenal
E-d ulcer. Consultant—Dr. H. F. Hewes. Op. (E. A. C.)—Abdominal exploration. No ulcer found. Appendectomy. Appendix not abnormal. Complications—None. Result, May 10, 1914—Attacks of slight indigestion. Fairly well.

2. Aug. 28, 1911. Female—18. Inability to breathe through nose. Con't—Dr. D. Crosby Greene. Op. (D. C. G.)—
O K Submucous excision of septum. Comp.—None. Result, Sept. 15, 1913—Improved but still has some trouble.

3. Aug. 28, 1911. Male—8. Enlarged tonsils and adenoids. Mouth breather. Con't—Dr. E. Crosby Greene. Op.
O K (D. C. G.)—Tonsillectomy and removal of adenoids. Comp. —None. Result, Sept. 15, 1913—Well.

4. Sept. 4, 1911. S. Female—41. Double chronic mastitis. Con't—Dr. R. B. Greenough. Op. (E. A. C.)—Amputation
O K of both breasts. Comp.—None. Result, Sept. 20, 1913—Well.

5. Sept. 5, 1911. Male—46. Constipation and pain due to fissure of the anus. Op. (E. A. C.)—Stretching of sphincter.
O K Comp.—None. Result, Aug., 1913—Well.

6. Sept. 5, 1911. Male—31. Balanitis. Op. (E. A. C.)—
O K Circumcision. Comp.—None. Result, Aug. 1913—Well.

7. Sept. 5, 1911. Female—34. Hernia in appendectomy scar
E-j from previous op. by E. A. C. for acute appendicitis. Recurrent attacks of vomiting and indigestion. Op. (E. A. C.)—Radical cure of hernia. Comp.—None. Dec. 6, 1911, reëntry—Fissure in anus. Op. (E. A. C.)—Stretching
P-r sphincter. Dec. 27, 1911, reëntry—for rest and further study. Result, Aug., 1913—General condition much improved. Scar solid. Still has distressing attacks of vomiting and indigestion, for which exploratory operation has been advised but not urged.

8. Sept. 14, 1911. Male—49. Renal colic and hematuria. Con'ts—Dr. A. L. Chute and Dr. F. B. Harrington. Op.—Cystoscopy and ureteral catheterization by Dr. Chute.
P-d Old blood withdrawn from renal pelvis. Symptoms immediately improved and disappeared entirely in a few days. Explor. op. on the kidney was advised but refused. Result—Died in May, 1913. Autopsy—Banti's disease and chronic nephritis.

9. Sept. 1, 1911. Male—12. Fracture of both bones of fore-
O K arm. Op. (E. A. C.)—Reduction of fragments. Comp.—None. Result—Perfect. (Exam. Aug. 1912).

10. Dec. 5, 1911. Male—84. Hemorrhage from a gangrenous melanotic sarcoma of the left cheek. Op. (E. A. C.)—Cocaine.
P-d Removal of sarcoma and skin plastic to cover defect. Comp. —None. Result—Died of recurrence on Mar. 7, 1912.

11. Dec. 12, 1911. Male—18. Acute hematogenous infection of kidney simulating appendicitis. Operation not advised. Con't—Dr. Farrar Cobb. No op. Result, July, 1913—Well. O K
12. Jan. 4, 1912. Case of apoplexy admitted as an emergency under the charge of her private physician. Death on second day. P-d
13. Jan. 17, 1912. Female—43. Persistent vomiting; abdominal pain; painful hemorrhoids, backache, etc. Op. (E. A. C.)—Removal of adherent obliterated appendix; ventral fixation; clamp and cautery for hemorrhoids; dilatation of sphincter ani. Later dilatation of esophagus by Drs. Robinson and Mosher. Comp.—None. Result, Aug., 1913—Well except for occasional symptoms of cardiospasm. O K
14. Jan. 21, 1912. Female—11. Recurrent mild attacks of right-sided abdom. pain. Pre-op. diag.—Chr. appendicitis. Op. (E. A. C.)—Removal of a strictured appendix. Comp.—None. Result, Sept. 2, 1913.—Well. O K
15. Jan. 27, 1912. Male—16. Large splinter in sole of foot for three weeks. Op. (E. A. C.)—Removal of splinter. Cocaine. Comp.—None. Result, Aug., 1913—No report. O K
16. Feb. 8, 1912. Female—26. Necrotic tuberculous gland of neck; recurrent. Op. (E. A. C.)—Thorough curettage. Result, June, 1913—Well. One small palpable gland. O K
17. Feb. 10, 1912. Female—39. Hemorrhoids. Op. (E. A. C.)—Clamp and cautery. Comp.—None. Result, Sept. 8, 1913—Well except for annoyance from skin tabs which were not removed. E-j
18. Feb. 11, 1912. Female—38. Intermittent right-sided abdominal pain and one attack of jaundice. Pre-op. diag.—Gall-stones. Comp.—Mild sepsis in abdom. fat, not delaying conval. S. albus. Attack malaria in second week. Parasite demonstrated by Dr. G. C. Shattuck. Result, Dec. 7, 1913—Well (physician). E-d E-c
19. Feb. 12, 1912. Female—49. Abdom. pain and fibroid tumors of uterus. Op. (E. A. C.)—Hysterectomy and appendectomy. Ap. strictured and adherent. Comp.—None. Result, Sept. 7, 1913.—Well. O K
20. Feb. 13, 1912. Neurasthenic female—44. Persistent vomiting, abdom. pain, and low urinary output. Great improvement under proper feeding and care for three weeks. Result, Aug., 1913—No report. O K
21. Feb. 15, 1912. Male—59. Recurrent attacks of painful indigestion of many years' standing. Recent profuse hematemesis. Pre-op. diag.—Duodenal ulcer. Op. (E. A. C.)—Post. gast. ent. and infolding ulcer. Comp.—None. Result, Aug., 1913—Well. OK

22. Feb. 15, 1912. Male. Emergency case of severe epistaxis
O K under charge of another physician. Result—No report.

23. Feb. 24, 1912. Male—59. Comminuted fracture and external displacement of head of humerus. Removed to
O K Corey Hill Hospital. Op. (E. A. C.)—Excision of head of humerus by "sabre cut" incision. Comp.—None. Result, Aug., 1913—Excellent. Can play a good game of golf.

24. Mar. 5, 1912. Male—59. Crippled with infectious arthritis of many joints and suffering from pronounced digestive disturbances of many years' standing; also profuse purulent chronic bronchitis. Referred by Dr. C. F. Painter to whom he had applied for relief from his arthritis. The patient
P-c was kept two weeks before operating in hope of improving his general condition which was wretched. Con't.—Dr.
P-d R. H. Fitz. Pre-op. diag.—Gall-stones. Op. (E. A. C.)—Multiple adhesions. Contracted gall-bladder containing
E-j a large stone and connected by tortuous suppurating sinus with duodenum. Cholecystectomy and drainage of sinus. Comp.—Pneumonia and leakage of duodenal contents and finally peritonitis. Lived 13 days. This was a case of diffuse chronic pneumococcus infection before operation, for pneumococcus-like organisms were obtained from the sputum and from the stomach washings. The latter came from the stomach tube in the form of false membranes resembling rose leaves in consistency and color. Under the microscope these proved to be almost pure masses of pneumococci. At autopsy pure cultures were also obtained from peritoneal cavity and from joints. The lungs showed multiple chronic bronchiectases and small areas of pneumonic consolidation. This case also illustrates the point which has been brought out by E. A. C. that the reason that Courvoisier's law holds true is that contracted gall-bladders in the presence of common duct-stone probably always have intestinal fistulæ at some time. Hence one never finds a contracted gall-bladder that is not adherent to the intestine.

25. Mar. 7, 1912. Female. Under the care of Dr. W. P. Graves.
O K Severe metrorrhagia. Op. (W. P. G.)—Abdom. hysterectomy for uterine insufficiency. Comp.—None. Result, Aug., 1913—No report.

26. Mar. 8, 1912. Female. Under the care of Dr. W. P. Graves.
O K Op.—Plastics on cervix and perineum; ventral fixation; appendectomy. Comp.—None. Result, Apr., 1913—Well.

27. Mar. 10, 1912. Male—17. Carbuncle of the upper lip.
O K No op. Recovery. Result—No report.

28. Mar. 13, 1912. Female—32. Chronic mastitis and mas-
O K todynia. Both nipples had previously been removed by another surgeon. Op. (E. A. C.)—Removal of both breasts.

Comp.—None. Result, Sept., 1913—Great relief from the above op. Now has distressing abdom. symptoms.

29. Mar. 28, 1912. Female. Under the care of Dr. W. P. Graves. Backache, fatigue and pelvic lacerations. Procidentia. Op. (W. P. G.)—Myomectomy and ventral fixation. Plastic on cervix and ant. and post. colporrhaphy. Comp.—Secondary hemorrhage from cervix of no practical importance. Result, Nov. 14, 1913—Well (physician).
30. Mar. 29, 1912. Female—16. Separation of right sacro-iliac synchondrosis from an automobile accident. Rest in bed for three weeks. Result, Aug., 1913—Well. Con't—Dr. R. B. Osgood. O K
31. Apr. 2, 1912. Male—45. Acute biliary colic and chronic indigestion. Pre-op. diag.—Gall-stones. Op. (E. A. C.)—Cholecystostomy and removal of stones. Comp.—None. Result, Aug. 21, 1913—Well. Slight digestive symptoms. O K
32. Apr. 7, 1912. Female—40. Intermittent hydronephrosis. Palpable tumor in left flank size child's head. Op. (E. A. C.) Kinking of ureter found to be due to aberrant vein to lower pole of kidney. Kinking prevented by suturing vein to pelvis of kidney. The vein was too large to be safely divided. Comp.—None. Result, July, 1913—Well. Kidney palpable. O K
33. Apr. 8, 1912. Female—29. Deep obstructive jaundice and a tumor in epigastrium. Pre-op. diag.—Empyema of gall bladder. Op. (E. A. C.)—The tumor proved to be an enormously distended common duct. 28 ounces of bile were aspirated and several ounces of bile later sponged out. The duct also contained about 2 ounces of muddy material and one very small facetted gall-stone. The dilatation extended into the hepatic ducts but the cystic duct and gall-bladder were of normal size and contained normal bile. Much bleeding at the operation; oozing continued from the wound until the 13th day, when, after consultation with Dr. M. H. Richardson and Dr. R. H. Fitz, transfusion was done by Dr. Beth Vincent. Bleeding at once ceased and the patient made a good recovery, leaving the hospital on the 54th day with a small biliary sinus. On Aug. 8, 1912, a choledochoduodenostomy was performed by Dr. Hugh Williams and Dr. E. A. Codman at the Massachusetts General Hospital. Six days after this op. typical cholemic bleeding again occurred to some extent, but was controlled by local packing and by injection of rabbit serum, 15 c.c., on the 14th day. No other comp. Result, Dec. 9, 1913—Well, but has had several attacks of mild jaundice with light pain. Feb., 1914—Well. E-j

34. Apr. 10, 1912. Male—44. Inflamed perineal sinus exactly
O K resembling a pylonidal sinus, but extending anteriorly from the rectum. Op. (E. A. C.)—Cocaine. Opening and packing sinus. Comp.—None. Result, Aug. 21, 1913.—Well.

35. Apr. 16, 1912. Female—37. Vague abdom. discomfort,
P-r constipation and inertia. For diagnosis and *x*-ray. Explor. op. was advised but not urged, under the diagnosis of ptosis and retroversion. Op. refused. Result, Sept. 4, 1913—No improvement.

36. Apr. 20, 1912. Male—40. Vague abdom. discomfort. For
E-j diag. and *x*-rays. Palpable tumors, evidently tuberculous mesenteric glands were found. Severe degree of ptosis.
P-d The patient on hearing that the chance of any relief from operation was small, did not wish to be operated upon.
C Result, Aug., 1913—No improvement. Sept. 19, 1913—Decided to take any risk. Op. (E. A. C. and G. W. M.) at Copp Hospital, Cambridge. Removal of four broken-down tuberculous glands of mesentery near ligament of Treitz. Removal of a greatly dilated prolapsed cecum with ascending colon and a small portion of ileum and a stenosed appendix. Acute dilatation of stomach on 3d day, relieved by repeated lavage. Recovered from the operation but died on Oct. 16, of pneumonia of six days' duration.

37. Apr. 22, 1912. Male—21. Right inguinal hernia. Op.
O K (E. A. C.)—Ferguson method. Comp.—None. Result—No report.

38. May 6, 1912. Female—51. Cancer of right breast. Op.
O K (E. A. C.)—Amputation and dissection of axilla. Axillary glands involved. Comp.—None. Result, Dec. 1, 1913—No sign of recurrence. Pain in arm.

39. June 3, 1912. Female—67. Details the same as case 38.
E-s Comp.—Slight necrosis edges of skin flaps. Result—died
P-d in July, 1913, of spinal metastasis.

40. June 2, 1912. Male—19. Septic olecranon bursitis. Op.
O K (E. A. C.)—Incision and packing of bursa. Comp.—None. Result—No report.

41. June 5, 1912. Female—78. Epithelioma of eyelid. Op.
O K (G. W. M.)—Removal of growth. Comp.—None. Result—Unknown.

42. June 8, 1912. Female—54. Recently recovered from a
O K subacute attack of appendicitis. During this attack she had been seen in consultation by E. A. C. and conservative treatment advised because her symptoms suggested that
P-d some other serious abdominal condition also existed—probably gall-stones. As a difficult operation was to be avoided if possible in a private house, it was felt wiser to wait until the patient could come to Boston. Op. (E. A. C.)

—The gall-bladder was normal; the appendix (still subacutely inflamed) was removed. There were a few small uterine fibroids which were not removed. The left tube was the size of a banana and was closed at the fimbriated end and presented the appearance of a chronic hydrops. It was removed entire and after removal showed on section a remarkable pedunculated cystic papillomatous tumor. The specimen was examined by Dr. W. F. Whitney and was pronounced a unique case of carcinoma of the Fallopian tube. It is preserved in the Warren Museum of the Harvard Medical School. From the specimen alone one would say that the possibility of recurrence was infinitesimal, so much healthy proximal tissue was removed with it, and yet the sequel showed a rapid recurrence, for 6 months later a second operation was done by E. A. C. at the patient's home and a diffuse carcinomatosis of the peritoneum found. The omentum was studded with the same minute beautiful yellow-green and orange cysts which characterized the original tumor. Result—The patient has since been treated by her physician under the direction of Dr. R. B. Greenough and Dr. E. H. Risley with cancer serum. Sept. 23, 1913—Is still living, but rapidly failing. Nov. 29, 1913—Apparent improvement. Able to be up (physician). Died Jan. 6, 1914. Autopsy—Diffuse carcinomatosis.

43. June 8, 1912. Emergency case of hemiplegia under the charge of another physician. Death on 16th day. P-d

44. June 9, 1912. Male—38. Perineal urethral abscess. Op. (G. W. M.)—Incision and drainage. Dilatation of stricture. O K Result, Aug., 1913—Well.

45. June 10, 1912. Female—54. Bad organic heart lesion. Sought relief from recurrent right-sided abdominal pain and digestive disturbances. *X*-ray examination unexpectedly showed a large stone in the right kidney. The combined E-j urine was normal. Ureteral catheterization showed that both kidneys secreted normal urine. The pheno-sulph. test appearing in 7½ minutes and showing 7 % on right and 23% C on left. Op. (E. A. C.)—Knowing that the left kidney was sound and believing as I do that one sound kidney is better than one sound one and one bad one, and that kidneys long blocked by stone seldom return to normal after nephrolithotomy, I removed the right kidney. After removal it showed beside the large stone several small ones, one of which was so buried in the kidney substance that it would not have been reached by pyelotomy. The patient made a good operative recovery. The wound was soundly healed and she was beginning to sit up, when on the 19th day she suddenly died. No autopsy was obtained, so it is uncertain

whether death was due to the heart lesion or to pulmonary embolism from the renal vein, probably the latter.

O K 46. June 13, 1912. Female—59. Purulent discharge from the right nipple and chronic mastitis. Op. (E. A. C.)—Excision of the right breast and removal of an epithelioma of the nose (incidentally discovered). Comp.—None. Result, Aug. 25, 1913—Well.

O K 47. June 18, 1912. Female—22. Dysmenorrhea. Op. (E. A. C.)—Dilatation of cervix. Comp.—None. Result, Oct. 2, 1913—Considerable improvement.

O K 48. July 1, 1912. Male—6. Constipation. Congenital dilatation of the sigmoid. Radioscopic examination and observation. Op. not advised. Result, Aug., 1913—Somewhat improved by conservative treatment.

O K 49. July 5, 1912. Female—29. Marked neurasthenia and subsiding acute appendicitis. Op. (E. A. C.)—Appendectomy. Ap. subacutely inflamed. Comp.—None. Result, Sept, 20, 1913—Greatly improved but still has vague abdominal symptoms.

E-s 50. July 6, 1912. Male—35. Typical symptoms of acute appendicitis of 12 hours' duration. Op. (E. A. C.)—Gangrenous appendicitis. Appendectomy and drainage. Comp. None. Result, Oct., 1913—Well except for small hernia in scar.

E-d 51. July 8, 1912. Female—42. Tumor of breast. Pre-op. diag. in favor of fibroma. Op. (Dr. C. C. Simmons present in consultation) (E. A. C.)—After exploration with cocaine, amputation of breast and dissection of axilla under ether, one axillary gland involved. Path. report—Cancer. Result, Nov., 1913—Well (exam.). A small cyst in other breast. Feb., 1914—Cyst has entirely disappeared. Well.

O K 52. Aug. 3, 1912. Female. Lipoma of forearm. Op. (E. A. C.) —Excision. Comp.—None. Result—No report.

P-d 53. Aug. 12, 1912. Female—37. Cauliflower cancer at umbilicus size of fist, infiltrating the adjacent muscles and having a fecal fistula in its centre. Pelvic induration. Patient bedridden. Operation at first refused by E. A. C. on the ground of inoperability. As the patient and her husband begged that some attempt be made, even at great risk, a consultation was held with Drs. C. A. Porter, D. F. Jones, and H. Cabot. Dr. Cabot had some years previously successfully removed a tuberculous stricture from the patient's rectum. It was decided to attempt operation and Dr. Porter consented to do it. Op. (C. A. P. and E. A. C.) —The growth with an oval area containing about one-half the abdominal wall with most of the transverse colon and omentum were removed *en masse;* end-to-end anastomosis

of colon. When this had been completed another annular carcinoma of the sigmoid was found buried in pelvic adhesions. This was obviously causing obstruction and yet could not be removed; a lateral anastomosis was done which successfully short-circuited it. At this time her condition, though one of shock, seemed viable if the abdominal wall could be closed. This seemed impossible, for the edges would not meet by several inches even under tension. Dr. Porter resorted to an expedient which he has before used but never published. With a few sweeps of his hand he mobilized the whole peritoneum back to the psoas muscle on each side. The intestines were easily sewed up in this free membrane as in a bag. Over this the fascia and skin were pulled as far as possible, but could by no means be brought together, and gauze was packed down to the peritoneal bag.

The patient recovered in spite of leakage from the colon anastomosis and a troublesome fecal fistula. (I have no hesitation in saying that this was the most remarkable abdominal operation I have ever seen which resulted successfully; nor have I ever seen such courage as this patient exhibited both before and after operation.) Result, Sept. 1, 1913—Her husband (a doctor) writes that in spite of a troublesome sinus she is up and about every day and that there is no sign of return of the growth. Died in Nov., 1913.

54. Aug. 19, 1912. Female. Fracture of calvicle. Result, Aug., 1913—Well, but has considerable bony callous. P-d

55. Aug. 23, 1912. Female—79. Extensive carcinoma of thyroid. Con't.—Dr. C. A. Porter. Op. (C. A. P. and E. A. C.)—Radical dissection. The growth had penetrated the capsule and invaded the carotid sheath. All visible malignant tissue was removed. Comp.—None. Result— P-d
The patient left the hospital with the wound healed on the 15th day. Recurrence was evident within a week and at once became fulminating. Death occurred within a month, at which time the recurrent growth was twice the size as at the time of operation.

56. Sept. 1, 1912. Female—36. Had suffered from abdominal pain suggestive of duodenal ulcer and had previously had an unsuccessful abdominal exploration by another surgeon
Pre-op. diag.—Peripyloric adhesions. Op. (E. A. C.)— O K
Multiple adhesions separated and raw surfaces covered by peritoneal plastic. Comp.—None. Result, Aug. 25, 1913—Still slight attacks of indigestion when overworked, but on the whole great improvement.

57. Sept. 7, 1912. Male—45. "Neuritis" and subacromial bursitis. Op. (E. A. C.)—Excision of a portion of bursa. Comp.—Protracted convalescence with much pain. Result, E-j
Aug., 1913—Well except for occasional twinges in shoulder.

58. Sept. 13, 1912. Very stout male—54. Right inguinal hernia.
O K Op. (E. A. C. Spinal anesthesia by Dr. Freeman Allen)—Radical cure (Bassini). Comp.—None. Result, Aug. 28, 1913—Well.

59. Sept. 18, 1912. Female—58. Constipation, weakness,
O K vague stomach symptoms, and a very tight sphincter ani. Op. (E. A. C.)—Proctoscopy and stretching sphincter. Comp.—None. Result, Aug. 18, 1913—Much relieved. No constipation. Slight hyperacidity.

60. Sept. 19, 1912. Female. Deformed and painful great-toe
O K nail, previously unsuccessfully operated on by another surgeon. Op. (E. A. C.)—Removal of nail and excision of matrix. Comp.—None. Result, Nov. 1, 1913—Well.

61. Oct. 11, 1912. Female—9. Under the care of Dr. Harvey Cushing. Acute internal hydrocephalus, complicating an interpeduncular (hypophysical) tumor. Op. (H. C.)—
E-d Callosal puncture and ventricular drainage. Relief of pressure symptoms. Comp.—None. Last note, Aug., 1913—Condition unchanged. Dec., 1913—Has since been operated on by Cushing at the Brigham Hospital.

O K 62. Oct. 11, 1912. See note on Case 125.

63. Oct. 17, 1912. Female—64. Under the care of Dr. Harvey
O K Cushing. Major trigeminal neuralgia. Op. (H. C.) Oct. 19, 1912—Sensory root avulsion. Comp.—None. Last note, July, 1913—Well.

64. Male—35. Right-sided abdominal pain. Pre-op. diag.—
O K Appendicitis. Op. (G. W. M.)—Appendectomy for subacute appendix. Comp.—None. Result, Aug. 13, 1913—Well. Gained 30 pounds.

65. Oct. 19, 1912. Male—52. Under the care of Dr. Harvey
P-d Cushing. Pituitary struma with hypopituitarism and blindness. Op. (H. C.) Oct. 21, 1912—Transphenoidal sellar decompression with partial removal of struma. Comp. —None. Last note—Condition unchanged.

66. Oct. 22, 1912. Male—20. Epilepsy. Old gunshot wound
P-d of head which had caused depressed fracture of skull. Con't. —Dr. Harvey Cushing. Op. not advised. Result, Aug., 1913 —Improved under bromides.

67. Oct. 22, 1912. Male—68. Under the care of Dr. Harvey
O K Cushing. Major trigeminal neuralgia. Op. (H. C.)—Sensory root avulsion. Comp.—None. Last note, Aug., 1913—Well.

68. Oct. 23, 1912. Male—43. Pain, constipation and palpable rectal tumor. Pre-op. diag.—Cancer of rectum. Con't.—Dr. D. F. Jones. Op. (E. A. C.)—Exploration showed a high cancer of rectum with adhesion to bladder, and multiple
P-d metastases scattered over pelvic peritoneum. The splenic

flexure was sutured to abdominal wall in such a manner as to make cocaine enterostomy easy later. Comp.—None. Result—The patient returned to his work, but the enterostomy was necessitated several months later and since then two secondary operations have been done, but in Nov., 1913, the patient was rapidly failing. Died in Dec., 1913.

69. Oct. 28, 1912. Male—54. Under the care of Dr. Harvey Cushing. Major trigeminal neuralgia. Op. (H. C.)— Sensory root avulsion. Comp.—None. Last note, Aug., 1913—Well. O K

70. Nov. 1, 1912. Male—5½. Under the care of Dr. Harvey Cushing. Cerebral birth palsy. No op. Result—No report. O K

71. Nov. 1, 1912. Male—64. Under the care of Dr. Harvey Cushing. Major trigeminal neuralgia. Op. (H. C.)— Sensory root avulsion. Comp.—None. Result—Not heard from. O K

72. Nov. 6, 1912. Male. Right inguinal hernia. Op. (E. A. C. and G. W. M.)—Ferguson method. Comp.—None. Result, Aug., 1913—Well (physician). O K

73. Dec. 4, 1912. Female. Turkey bone impacted in esophagus. Bone pushed into stomach by bougie. Comp.—None. Result, Sept., 1913—No further trouble from this cause. O K

74. Dec. 4, 1912. Female—30. For many years had suffered from constipation, lassitude, toxic headaches, undue fatigue, dysmenorrhea, abdominal discomfort and soreness. The appendix had been removed a year previously by E. A. C. Pre-op. diag.—Intestinal stasis. Operation was undertaken with the intention of doing iliosigmoidostomy. Op. (E. A. C.) —Double hydrosalpynx with enormous flaccid dilatation of both tubes was found. Double salpingectomy and peritoneal plastic. Comp.—Slight serous discharge from wound causing no delay in convalescence. Result, Aug. 24, 1913—Greatly improved, but still has toxic headaches. Jan., 1914—Well except slight headaches. E-s P-d

75. Dec. 5, 1912. Male. Injury to elbow. *X*-ray. No fracture. Prompt recovery. No report. O K

76. Dec. 7, 1912. Male—43. Symptoms of duodenal ulcer for many years. Persistent vomiting, loss of compensation in muscular power of stomach, arteriosclerosis, marked albuminuria. Bld. pressure 240. This patient was kept under lavage for 9 days to restore the compensation of the stomach. The operation was then done without post-operative pain or shock under the principles of anoci-association. Op. (E. A. C.)—Moynihan operation of gastro-enterostomy and infolding of duodenal ulcer. Comp. —None. Result—The patient had no return of stomach O K P-d

symptoms during his life. He returned to hard work as a lawyer and seemed in better health than for years until May, when he was taken with acute cardiorenal symptoms and died on May 14, 1913.

77. Dec. 9, 1912. Female—59. Recent attacks of gall-stone
O K colic. Op. (E. A. C.)—Cholecystostomy for cholelithiasis. Ap. adherent. Appendectomy. Comp.—None. Result, Sept., 1913—Well.

78. Dec. 16, 1912. Female—54. Had been operated on by E. A. C. three years previously for cancer of the breast. For more than a year before entrance she had showed symptoms of a metastasis in the dorsal spine. There was intense girdle pain, excessive nausea and incessant vomiting. For
E-d three weeks no nourishment had been retained and even a grain of morphine in 24° failed to keep her comfortable. She was taken into the hospital for diagnosis and an *X*-ray exam. of the spine. The latter showed a well-marked defect in the body of a dorsal vertebra. Abdominal operation was considered because for years she had had symptoms gall-stones and it was felt that possibly the latter might be causing the present symptoms. Operation was decided against by E. A. C. on the ground that the patient's condition was too poor and offered very little hope. Emaciated, almost pulseless, she was taken home to die. Result—After her return home this patient was treated by her husband (a physician) and another physician, and by a Christian Scientist. For several weeks she lay between life and death but eventually recovered. On Aug. 26, 1913, her husband wrote as follows: "My dear doctor: I am glad to report that Mrs.—— is gaining every day. She has gained six pounds since the first day of July. She is better than she ever has been. She is able to eat things she has never been able to eat before since she was twenty years old, and digest them perfectly without any trouble. Has no gases and is free from pain of any kind in her spine. I fell satisfied that her trouble was gall-stones, and I believe she expelled a large one on the 25th or 26th of December, as on that day we had a great deal of trouble during a movement. And after that time I examined and weighed everything that entered her stomach or left her, but she certainly is better than she has been for years."

This was certainly a recovery "when the doctors had given her up." It was as miraculous as any surgical "cure" that I have ever seen. Should it be placed to the credit of Christian Science or added to the lists of the Follies of Wisdom, at least it will always leave me with some hope for hopeless cases. (E. A. C.) On May 2, 1914, reported well.

79. Dec. 20, 1912. Female—68. Carcinoma of the right side of the tongue. Op. (E. A. C. and G. W. M.)—Removal of right half of the tongue and dissection of the right side of the neck. Drainage. Path. report—Cancer. Comp.—None. Result, Aug. 22, 1913—There has been no evidence of any return of disease (physician). O K
80. Dec. 22, 1912. Male—71. Hematuria from hypertrophied prostate. Op. (E. A. C. and G. W. M. Spinal anesthesia by Dr. Freeman Allen)—Suprapubic prostatectomy. Comp.—Double epididymitis. Reëntry May 19, 1913. Transient attack of epididymitis which quieted down with rest. Result, Aug. 23, 1913—Well. Bacteriuria. E-s
81. Dec. 30, 1912. See note on Case 125. O K
82. Dec. 30, 1912. Female—30. Dysmenorrhea. Op. (G. W. M.)—Dilatation and curettage. Result, Sept., 1913—Well. O K
83. Jan. 10, 1913. Male—8. Congenital right inguinal hernia. Op. (G. W. M.)—Radical cure of right inguinal hernia. Comp.—None. Result, Aug., 1913—Well. Reëntry, March 14, 1913—Left inguinal hernia. Op. (G. W. M.)—Radical cure. Comp.—None. Result, Aug., 1913—Well. O K
84. Jan. 11, 1913. Female—23. Epigastric pain and distress. Vomiting. Diag.—Duodenal ulcer. Operation advised and refused, diet prescribed. Result, Sept., 1913—Stomach still "weak," but able to work as house-maid. Occasional vomiting. P-r
85. Jan. 22, 1913. Female—57. Cancer of cervix uteri. Con't.—Dr. Farrar Cobb, who advised ligation of internal iliac arteries, as growth was too extensive for radical operation. Operation refused. Result—Patient has had *x*-ray treatment through the abdominal wall by a "specialist" in the regular profession. Aug., 1913—No appreciable change in condition. May, 1914—Death has been reported without exact date. P-d
86. Jan. 23, 1913. Female—36. For several years had had a chronic cough with a small amount of sputum which was occasionally blood tinged. Repeated examinations by specialists had failed to reveal physical signs in the nose, throat or chest, or of tubercle bacilli in the sputum. On Jan. 23, 1913, she was suddenly taken with an epileptiform seizure. She was seen in consultation by Dr. E. W. Taylor and by Dr. Harvey Cushing, and on Feb. 15, 1913, was removed to the Brigham Hospital to be under Dr. Cushing's care. After thorough examination she was subjected to a decompressive craniotomy under the pre-operative diagnosis of brain tumor. Great intracerebral pressure was found, but even after the operation no localizing signs developed. She died soon after. Autopsy showed a huge brain abscess and a chronic bronchiectasis to which it was probably due. E-d P-d

87. Jan. 23, 1913. Female. Tumor in the lower abdomen extending into postcul-de-sac. Previously had had three operations by other surgeons for salpingitis. Pre-op. diag.—Cyst of broad ligament. Op. (E. A. C. and G. W. M.)—
O K Excision of multiple cystic tumors probably arising from right ovary. A gallstone removed and gall bladder sutured. Careful peritoneal plastic, covering raw surfaces; left ovary, though adherent, not removed. Comp.—None. Result, Aug. 29, 1913—Well. (Letter.)

88. Jan. 25, 1913. Female—26. Breast abscess. Op. (G. W.
O K M.)—Opened and drained. Comp.—None. Result, Aug., 1913—Well.

89. Jan. 27, 1913. Male. Acute appendicitis. Under the care
O K of Dr. F. B. Harrington. Op. (F. B. H.)—Appendectomy and drainage. Comp.—None. Result—Well in Spring of 1913. (F. B. H.)

90. Jan. 27, 1913. Stout female—36. Abdom. pain of 12 hours'
E-d duration. Pre-op. diag.—Subacute appendicitis. Op. (E. A. C. and G. W. M.)—Appendectomy. Appendix showed evidence of a previous attack but no sign of acute inflammation. Comp.—None. Result, Aug., 1913—Well.

91. Feb. 1, 1913. Female—22. Ugly scar on upper lip. Op.
O K (E. A. C.)—Completion of a plastic operation previously done by E. A. C. Comp.—None. Result, Nov., 1913—Apperance greatly improved.

92. Feb. 4, 1913. An elderly man with uncompensated organic
P-d heart lesion. Under the care of his private physician. Died Mar. 2, 1913.

93. Feb. 5, 1913. S. female—25. Acute abdominal pain of 6 hours' duration. Pre-op. diag.—Acute appendicitis. Con't.
O K —Dr. F. B. Harrington. Op. (E. A. C. and G. W. M.)—Appendectomy. Appendix acutely inflamed but not perforated. Closed without drainage. Comp.—None. Result, Oct., 1913—Well.

94. Feb. 13, 1913. A poorly developed s. female—28. Constipation, vague abdominal pain, backache, frequency of micturition, visceral ptosis and all the signs of intestinal intoxication. Expl. op. (E. A. C. and G. W. M.)—A
P-d strictured appendix removed. Marked ptosis. Colopexy by method of Coffey. Ventral suspension of uterus. Comp. —None. Result, Aug. 26, 1913—Great improvement in general symptoms for months but recently partial relapse. On the whole a satisfactory gain and at present gaining (letter.) Apr. 28, 1914—Condition decidedly better than before op.

95. Feb. 20, 1913. Female—38. Dysmenorrhea and endome-
O K tritis. Op. (G. W. M. and E. A. C.)—Dilatation and curettage and ventral suspension. Comp.—None. Result, Aug., 1913—Well.

96. Mar. 5, 1913. Male—37. Tumor of left parotid. Pre-op. diag.—Enchondroma. Op. (E. A. C. and G. W. M.)—Cocaine. Excision of tumor which involved facial nerve and proved to be adenocarcinoma. Comp.—Facial paralysis E-d
Reëntry—Op. (E. A. C. and G. W. M.)—Radical removal of entire parotid and dissection of neck. Result, Aug., 1913—An enlarged gland beneath sternomastoid. Op. advised and refused. (A tumor size of pea had been removed from this patient's eyelid (left) several years before.) P-d
97. Mar. 7, 1914. See Case 125. O K
98. Mar. 8, 1913. Male—50. Dislocated shoulder; one week's duration. Op. (E. A. C. and G. W. M.)—Ether reduction. Result, Aug., 1913—Well. O K
99. Female—30. Acute abdom. pain. Pre-op. diag.—Ovarian cyst with twisted pedicle. Op. refused. Result—Patient writes on Sept. 15, 1913, that she has been quite well and has gained weight. She has occasional pain in her side and expects to be operated upon later. P-r
100. Mar. 13, 1913. See Case 125. O K
101. Mar. 14, 1913. Male—40. Double inguinal hernia. Op. (G. W. M.)—Double Bassini. No sac on left side. Comp.—None. Result, Aug., 1913—Well (letter). O K
102. Mar. 15, 1913. Female. Attacks of right-sided abdominal pain and general debility. Pre-op. diag.—Chronic salpingitis. Op. (E. A. C. and G. W. M.)—Double salpingectomy and oöphorectomy for adherent tubes, chronic ovarian inflammation. Peritoneal plastic. Comp.—None. Result, Aug., 1913—Well except for lack of strength (letter). O K
103. Mar. 17, 1913. Male—29. Very large right inguinal omental hernia. Op. (E. A. C. and G. W. M.)—Excision of about 2 lbs. of omentum and Bassini operation. Comp.—None. Result, Nov. 17, 1913—Well; slight hydrocele. E-s
104. Mar. 18, 1913. S. female—52. Hemorrhoids. Op. (E. A. C. and G. W. M.)—Clamp and cautery. Comp.—None. Result, Dec. 9, 1913—Well except for discomfort from "tabs" and slight itching. E-j
105. Mar. 21, 1913. Male—42. Acute intestinal obstruction of 34 hours' duration. Repeated attacks of abdominal pain for one month. Right iliac abdom. tumor. Pre-op. diag.—Acute appendix abscess. Op. (E. A. C. and G. W. M.)—Excision of an intussusception of small bowel in which the advancing point was a Meckel's diverticulum. Lateral anastomosis and temporary proximal enterostomy which was closed on the fourth day without ether. Comp.—None. Result, Sept. 8, 1913—Reëntry for removal of proximal end of bowel which practically made a hernia in scar. Op. (E. A. C. and G. W. M.)—Old scar excised and redundant E-d

portion of bowel removed. Careful peritoneal plastic. Comp.—None. Result, May 2, 1914—Well (exam.). No hernia. Slight pain in scar.

106. Mar. 23, 1913. S. female—32. Large abdominal tumor.
O K Pre-op. diag.—Large fibroid or cyst of ovary. Op. (E. A. C. and G. W. M.)—Hysterectomy for fibroid tumor. Comp.—None. Result, Aug., 1913—Well.

107. Mar. 24, 1913. Male—40. Recurrent attacks right-sided
O K epididymitis. Op. (G. W. M.)—Epididymectomy. Comp.—None. Result, Aug., 1913—Well.

108. Mar. 26, 1913. Female—24. Varicose veins of right leg. Under the care of Dr. Herman Bucholz. Op. (H. B.)—
O K Partial excision of veins. Comp.—None. Result, Nov. 1, 1913—Well.

109. Mar. 26, 1913. Male—25. Chronic inflammatory epididymitis. Double. Op. (G. W. M.)—Partial double epididymectomy. Comp.—None. Result, Aug., 1913—Well.
E-j Reëntry, Sept. 20, 1913—Remains of right epididymis removed. Drainage. Sinus to stump of left wound removed. Comp.—None. Result, Nov. 1, 1913—Well.

110. Mar. 27, 1913. Male—57. Tumor in right iliac fossa. Cachexia; loss of weight and abdominal gain. Pre-op. diag.—Cancer of cecum. Op. (E. A. C. and G. W. M.)—Excision of cecum, ascending colon and a portion of ileum and another coil of small intestine together with a portion
O K of the abdominal wall *en masse*. Four end-closures and two lateral anastomoses of the intestine. Plastic of abdominal wall to cover defect. This operation was done under the principles of anoci-association. It was started with a pulse of 72, took 3½ hours and finished with a pulse of 80. There was no obvious shock and almost no postoperative pain. Comp.—Serous discharge along the course of wick—probably ascitic peritoneal leakage. Result, Aug., 1913—Well. Jan., 1914—Well (physician).

111. Mar. 27, 1913. Male—68. Cystitis and gout which were
P-r temporarily relieved by rest in bed. Prostatectomy advised and refused.

112. Apr. 4, 1913. Stout female—47. Stiff, partially flexed knee and symptoms of dislocation of semilunar cartilage of many years' duration. No relief from a recent ether manipulation
E-j by another surgeon. Op. (E. A. C. and G. W. M.)—A damaged semilunar cartilage removed in halves by ant. and post. incisions. Comp.—None except induration in popliteal space, probably from escaping fluid. Result Aug. 14, 1913—Patient still limps badly and motion of knee is a little less than 90 degrees but still improving. Apr., 1914—Much improved.

113. Apr. 6, 1913. Male—12. Acute right-sided abdominal pain. Diag.—Acute appendicitis. Op. (G. W. M.)—Appendectomy. Appendix gangrenous. Comp.—None. Result, Aug., 1913—Well. O K

114. Apr. 13, 1913. S. female—46. Irregular fibrous enlargement of both breasts. Pre-op. diag.—Chronic mastitis. Con't.—Dr. R. B. Greenough. Op. (E. A. C. and G. W. M.)—Amputation of both breasts. Comp.—None. Path. exam. showed fibrosis with nearly complete disappearance of glandular tissue. In one breast was an area of cancer so small that the whole tumor was visible in low-power field of microscope. Comp.—A slight necrosis of edge of skin size of half-dime. Result, Aug., 1913—Well except for a small uncomfortable tab on scar. This was removed under cocaine. E-s

115. Apr. 22, 1913. S. female—30. Clear history of repeated attacks of appendiceal colic. Op. (E. A. C. and G. W. M.)—Appendectomy under local anesthesia with a few breaths of nitrous oxide. Appendix strictured; filled with concretions. Scarcely any operative or postoperative pain. Comp.—None. Result, Aug. 1, 1913—Well. O K

116. Apr. 23, 1913. Nervous female—24. Persistent pain in right iliac region worse at ctm. Pre-op. diag.—Cecum mobile. Op. (E. A. C. and G. W. M.)—Appendix was found plastered on cecum by a "Jackson's veil." Partial rotation of cecum so that ileum entered from behind; appendectomy; appendix normal. Comp.—None. Result—Greatly improved by operation but still has vague pain in right abdomen. O K

117. Apr. 24, 1913. Female—26. Persistent abdominal discomfort, nausea, constipation, weakness and nervousness. Came for diagnosis and *x*-ray examination. A diagnosis of general ptosis was made and operation was not advised. Careful instruction in hygiene was given. Result, Aug. 29, 1913—Considerable improvement but same symptoms persist (letter). P-d

118. Apr. 30, 1913. Male—38. Dislocation of wrist and fracture of carpal scaphoid of several weeks' duration. Under ether without incision the dislocation was reduced and the scaphoid fragment replaced by E. A. C.'s method. Comp.—None. Result, Aug., 1913—Fair motion. Improving. O K

119. May 2, 1913. S. female—43. E. A. C. had operated for cancer of the breast 3 years before. Palpable supraclavicular gland. Op. (E. A. C. and G. W. M.)—Glands removed from supraclavicular space proved to be normal. Comp.—None. Result, Aug., 1913—Well. May, 1914—Has since been op. for glands in opposite axilla. E-d

120. May 9, 1913. Male—25. Traumatic amputation of finger.
O K Op. (G. W. M.)—Reamputation. Comp.—None. Result, Aug., 1913—Well.

121. May 12, 1913. S. female—24. Recurrent attacks of pain in right iliac fossa, dysmenorrhea and prolapse of the right
O K ovary. Pre-op. diag.—Chronic appendicitis. Op. (E. A. C. and G. W. M.)—Removal of a strictured appendix and suspension of right ovary. Comp.—None. Result, Apr. 1914—Well.

122. May 15, 1913. M. female—42. Diagnosis—Gall-stones.
P-r Lost her courage and went home without operation. Result—No report.

123. May 19, 1913. Female—29. Admitted as an emergency.
O K Hysteria. Result, Sept., 1913—No report.

124. May 19, 1913. Female—45. Hematemesis, distress and vomiting. Also profuse uterine hemorrhage and abdominal
O K tumors. Pre-op. diag.—Ulcer of stomach and uterine fibroid. Op. (E. A. C. and G. W. M.)—No ulcer. Hysterectomy for multiple fibroid tumors. Appendectomy. Comp.—None. Result, Aug., 1913—Progressive improvement, but has not yet recovered from her chronic invalidism.

125. May 19, 1913. This case and also Cases 62, 81, 97, 100, were
O K tertiary cases treated with salvarsan. All were improved. No more cases of this kind will be accepted.

126. May 20, 1913. Female—36. Three attacks of right-sided
O K abdominal pain. Pre-op. diag.—Chronic appendicitis. Op. (G. W. M.)—Appendectomy. Freeing of abdominal adhesions. Comp.—None. Result, Aug., 1913—Well.

127. May 22, 1913. Male—49. Acute empyema of unknown origin, preceded by an alveolar abscess. Condition very poor. Op. (E. A. C. and G. W. M.)—Resection of rib and drainage.
P-d Comp.—None. Result, Sept. 25, 1913—Still discharge from wound. General condition excellent. Dec. 1, 1913—Has since been op. on at P. B. Brigham Hospital for closure of cavity.

128. May 23, 1913. Male—57. Right inguinal hernia. Op.
O K (E. A. C. and G. W. M.)—Local anesthesia. Ferguson method. Comp.—None. Result, Sept., 1913—Well.

129. May 26, 1913. Female—26. Severe constant abdominal pain in lower left quadrant. Pre-op. diag.—Chronic sal-
O K pingitis and retroversion. Op. (G. W. M.)—Left salpingectomy. Left oöphorectomy, appendectomy and ventral suspension. Comp.—None. Result, Aug., 1913—Well.

130. May 26, 1913. Male—44. Septic dog bite of leg and
O K popliteal abscess. Op. (E. A. C.)—Incision and curettage. Comp.—None. Result—No report.

131. May 28, 1913. Male—52. Hand crippled by a painful swelling of the tendon sheaths of the wrist and palm extending into the little finger. Pre-op. diag.—Tuberculous tenosynovitis. Op. (E. A. C. and G. W. M.)—Amputation of little finger with thorough dissection of gelatinous tissue from tendons of palm and wrist, the annular ligament being divided. Closed without drainage. Path. report showed chronic inflammatory tissue not inconsistent with a tertiary or tuberculous lesion. Wassermann reaction was positive. Comp.—None. Result—No report. E-d
132. May 29, 1913. An obese male—42. Right inguinal hernia. Op. (G. W. M.)—Radical cure of right inguinal hernia. Result, Aug., 1913—Well. O K
133. June 3, 1913. Male—68. Ulcerated carcinoma of floor of mouth at frenum and attached to gum. Op. (E. A. C.)—Wide excision of ulcerated area with removal of 1½ inches alveolar process and dissection of submental and submaxillary glands through floor of mouth. Wound packed without sutures. Comp.—None. Result, Aug., 1913—Well. Minute sinus in gum. May 2, 1914—Reported to be well. O K
134. June 4, 1913. Male—69. Right inguinal hernia. Op. (E. A. C.)—Bassini. Double sac. Comp.—None. Result, Aug., 1913—Well. O K
135. June 6, 1913. Thin feeble female—58. Marked visceral ptosis; complaining of vague, abdominal pain and distress. *x*-ray exam., etc. Operation not advised. Result—No report. O K
136. June 11, 1913. M. female—48. General abdominal discomfort and nervousness. Vague symptoms which have been called "sciatica." Polypoid mass protruding from the cervix uteri. Op. (E. A. C. and G. W. M.)—Polyp proved a pedunculated cyst of cervical canal. Excised with a portion of base. Plastic repair of cervix. Comp.—None. Path. report—Benign. Result, Aug. 21, 1913—Much better but still has leucorrhea. P-d
137. May 29, 1913. W. female—43. Widow of an old patient of E. A. C.'s with same disease. Incipient tuberculosis. Slept on roof for 25 days pending admission to state sanitorium. Con't.—Dr. John B. Hawes. P-d
138. June 21, 1913. Male—69. Indigestion and epigastric pain for many years. Pre-op. diag.—Duodenal ulcer. Op. (E. A. C. and G. W. M.)—Postgastro-enterostomy for duodenal ulcer. (Anoci.) Comp.—Sterile serous discharge from wound causing slight delay in healing. Result, Apr., 1914—Well, but cautious about diet. E-s

139. June 30, 1913. Male—39. Incompetent sphincter ani due
O K to fistula operation many years before. Op. (E. A. C. and G. W. M.)—Scar excised and edges of sphincter approximated. Comp.—None. Result, Aug. 18, 1913—Improved a great deal but not yet perfect control of gas.

140. July 8, 1913. Male—51. Another surgeon had performed cecostomy to permit irrigation of the colon for chronic intestinal stasis. The opening had contracted and was painful. Op. (E. A. C.)—Novocaine. Excision of scar
O K tissue and resuture edge of bowel. Catheter tied in. Comp. —None. Result, Sept., 1913—The result of the original operation has been excellent; gain in weight and strength and a sense of well-being having replaced constant distress, depression, and malnutrition. The second operation was also efficacious.

141. July 8, 1913. S. female—65. Chronic indigestion and epigastric pain. Stiff and painful right shoulder. Pain in left hip. Pre-op. diag.—Duodenal ulcer and adherent subacromial bursitis. Op. (A. E. C. and G. W. M.)—
O K Infolding ulcer and postgastro-enterostomy. Manipulation of shoulder. Comp.—None. Result, Oct., 1913—Well except for hip, which is still troublesome (exam.)

142. July 9, 1913. Large well-developed male—45. Recurrent attacks of indigestion and epigastric distress. Pre-op. diag.—Duodenal ulcer. Op. (E. A. C. and G. W. M.)—A contracted pylorus. First portion of duodenum fixed
E-d high and attached to gall-bladder by adhesions (congenital). No ulcer demonstrable. Appendix twisted and kinked and wholly adherent behind cecum. Marked Lane's kink divided but no plastic done. Appendectomy. Duodenal adhesions not disturbed. Comp.—None. Result, Sept., 1913—Well.

143. July 16, 1913. M. female—47. Cyst of right lobe of thyroid,
O K size of chestnut. Op. (E. A. C. and G. W. M.)—Enucleation of cyst. Comp.—None. Result, Aug., 1913—Well.

144. July 19, 1913. Male—48. Infected wound of hand. Op.
O K (G. W. M.)—Opening and cleaning wound. Comp.—Cellulitis to elbow. Result—No report.

145. July 24, 1913. Male—43. Persistent severe epigastric pain. Pre-op. diag.—Cancer of stomach. Op. (E. A. C. and G. W. M.)—Exploration showed inoperable cancer cardiac
E-j end of stomach and large multiple soft metastases of liver. Comp.—Although nothing beyond exploration was attempted
E-d the pain was greatly relieved. Result—The patient died about 2 weeks after his return home. Autopsy showed masses in liver to be broken down malignant disease. Primary growth at cardiac opening of stomach and lower esophagus.

146. July 22, 1913. Male—74. Large inoperable cancer of the thyroid causing extreme dysnea by displacement of the trachea. Con't.—Dr. C. A. Porter. Op. was undertaken by Dr. Porter as a purely palliative measure. Tracheotomy was accomplished by removal of a portion of the growth. Comp.—Severe secondary hemorrhage and sepsis. Died on the tenth day (Aug. 3, 1913). P-d P-c E-s E-j

147. July 30, 1913. Male—9. Compound fracture lower end of humerus. Op. (G. W. M.)—Cleansing and replacement of fragments. Comp.—None. Result, Sept., 1913—Slight limitation of extension. Flexion normal. O K

Attention is called to the fact that in all cases operated on by my assistant, Dr. George W. Morse, the results were perfect. In addition, I am indebted to him for assistance in the successful performance of a few instances of practically every important operation in modern abdominal surgery, for besides the above list we have since done at the hospital partial gastrectomy, choledochotomy, and choledochoduodenostomy.

KEY TO WRITER'S CRITICISMS

SUMMARY OF ERRORS POSSIBLY DUE TO LACK OF TECHNICAL SKILL. E-s

Case 39. Necrosis of skin from tight suturing after amputation of breast.
Case 50. Hernia following appendectomy with drainage.
Case 80. Epididymitis following prostatectomy.
Case 103. Small hydrocele following radical cure of a large hernia.
Case 114. Annoying projection in scar following amputation of breast.
Case 146. Secondary hemorrhage following difficult tracheotomy for dyspnea in case of cancer of thyroid.

SUMMARY OF ERRORS POSSIBLY DUE TO LACK OF JUDGMENT. E-j

Case 7. An error of judgment was made at the first operation in regard to drainage.
Cases 17 and 104. Annoying tabs left after hemorrhoid operation. Possibly they should have been removed.
Case 24. The duodenum might have been sutured rather than drained.

Case 33. Possibly choledochoduodenostomy should have been done at the first operation—but the patient recoverd.
Case 36. Wisdom of excision of cecum was questionable.
Case 45. Nephrectomy vs. nephrotomy.
Case 57. The patient was allowed to go home too soon.
Case 109. Whole epididymis should have been removed at first operation.
Case 112. Perhaps it would have been better to have left the post. half of the cartilage than to have made a second incision.
Case 146. There was but little hope even of prolonging life. Perhaps no attempt should have been made.

Summary of Errors Possibly Due to Lack of Care or Equipment. E-c

Case 18. The sepsis in this case was very mild and did not delay the convalescence. Iodine preparation was used at this time and afterward abandoned.
Cases 74 and 138. Serous wound leakage following the use of quinine urea in the anoci technique. We probably used it too thoroughly. No harm was done and no real delay of the convalescence caused. These cases are mentioned because of all other closed cases had perfect, dry, primary union, nor was there undue sepsis in drained cases.

Summary of Cases where Error was made in Diagnosis, although Happily no Serious Results Followed. E-d

Cases 1, 18, 90, 142. Cases in which appendectomy was done and the symptoms were relieved, but the diagnosis were incorrect.
Cases 51, 96, 119. Needless exploratory operations under cocaine.
Cases 61 and 86. Exploratory craniotomies under slightly incorrect diagnoses.
Case 78. The mistake in diagnosis might be passed as good judgment.
Case 105. Intussusception was mistaken for appendicitis.
Case 131. Possibly medicinal treatment might have been as effective.
Case 145. The diagnosis was correct, but its certainty would have saved a useless operation.

Summary of Cases in which the Condition of the Patient was Partly Responsible for the Poor Result. P-c

Cases 24, 36, 146. In these cases the enfeebled condition of the patient was partly to blame for the result. These operations were all desperate attempts to relieve unbearable conditions.

Summary of the Cases in which the Nature or Extent of the Disease was the Main Cause for Failure. P-d

Cases 10, 39, 42, 53, 55, 68, 85, 96, 145, 146. Either inoperable cases of cancer or cases in which operation offered little hope.

Cases 74, 94, 117. Severe grades of ptosis. They were benefited but not cured.

Cases 8 and 76. Cases of chronic nephritis, but the symptoms for which they came were successfully relieved.

Cases 12 and 43. Cases of apoplexy.

Case 24. Diffuse chronic pneumococcus infection.

Case 54. Oblique fracture of the clavicle which always leaves some deformity.

Case 65. Hypophyseal tumor.

Case 86. Cerebral abscess.

Cases 45 and 92. Organic heart disease.

Case 127. Neglected empyema.

Case 136. Leucorrhea.

Case 137. Pulmonary tuberculosis.

Cases who Refused to Accept Treatment. P-r

Cases 8, 35, 84, 99, 11, 122. All these patients preferred their known discomforts to the risks of surgery. They were told that there was no necessity for operation. Operation was advised—not insisted upon.

Surgical Calamities. C

Case 36. Pneumonia coming three weeks after a successful laparotomy.

Case 45. Sudden death—perhaps from embolism—in a convalescent patient whose wound is healed may fairly be included in the calamities of surgery. It is right to acknowledge that such calamities occur, although both these patients were very unfavorable subjects for surgery.

Suggestions for Improvement when Failure in Treatment has Been Admitted, Recorded, and its Causes Analyzed as to Our Power to Control Them

In a general way all the errors of surgical knowledge, skill, judgment, care and diagnosis are controllable to a great extent by organization. A great step will be made in this direction by the mere publicity of the end-result system, for it will soon tend to make it the custom for the young

man who wishes to make a reputation always to aim to put off on his superiors the cases which he knows are likely to turn out badly, instead of attempting difficult operations himself, because he has no reputation to lose. The young surgeon should get his technical training in doing easy cases *perfectly*. When he can do all the common simple operations perfectly he may begin to do the really difficult ones to help his seniors out. He can cultivate his judgment by picking out the cases which he knows he *can* do. Judgment is harder to acquire than skill.

On the other hand the chief of service, loaded with the difficult cases, will be obliged to give to his younger colleagues the easy ones, so that he may have time to attend to the difficult ones himself. When he asks a junior to do a series of difficult cases, he will pick out that junior for his fitness to do the work. When he himself realizes his own failures in certain classes of difficult cases by comparison with other hospital reports, he will send some one of his more experienced juniors to other clinics to learn new methods, and will give this man an opportunity to develop these new methods on his return. When it grows to be the spirit of the hospital that no subordinate is to get a poor result, unless it is impossible to obtain the services of his superior, or unless he is chosen by his superior because of his fitness to take charge of the case in hand, a great improvement in *esprit de corps* will be achieved. At present in many hospitals the good will of the senior in provate practice has more potency on the *esprit de corps* than the idea of "team work" to obtain the best possible results. This tends to develop and place in power the subservient assistant rather than the independent thinker who respects a demonstrated fact more than the dictum of an authority.

To illustrate more in detail the possible improvement from organization, let us take a few examples from page 85 under each heading.

ERRORS FROM LACK OF SURGICAL KNOWLEDGE OR SKILL

Case 50. Hernia following drainage in cases of acute appendicitis is a very common complication occurring in perhaps one-third of the cases. Is any one doing anything to improve our methods of operating so as to avoid this unpleasant and often dangerous sequel? At most great hospitals no one is even making an effort to find out how often it occurs, much less to find the relative frequency according to the method of incision. Even leaving humanity out of consideration, every case that returns for a secondary operation for a preventable hernia is an expense to the hospital of the per capita cost per day multiplied by the number of days of his stay for the second operation. Calculate what sum this will be in any large hospital!

In a large hospital, if the chief of service should assign one member of the staff to investigate and solve this problem it could be done—at least the percentage could be much reduced. The only objection would be that the rest of the staff might fear that the public would hear too much about the operator who performed this important service!

ERRORS OF SURGICAL JUDGMENT

These would be diminished in number if the custom were established of making it a routine to consult other members of the staff for important decisions and to place this consultation on record as in Cases 24 and 33. But the seeking of advice should never imply that it is necessary to accept it.

ERRORS OF CARE

It is obvious that organization has much to do with these. For instance, the occurrence of sepsis should be under con-

stant surveillance and rigidly and authoritatively investigated. From a financial point of view alone, this should be done; the expense would be saved in the diminution of waste products. Every little stitch abscess should be traced to its source, for straws show the direction of the wind.

ERRORS OF DIAGNOSIS

Cases 1, 18, 90, 142, are instances. How can organization improve this? The mere enforcement of the end-result system is a tremendous advance. Compel the operator to commit himself, and when a diagnostician is found, give him all honor.

The writer has already pointed out the fact that more pathologic appendices are found in laparotomies for other diagnoses than are found in cases operated on for "chronic appendicitis." This statement could be readily proved or disproved by the staff of any hospital if they would undertake to write down before every laparotomy their opinion as to the condition of the appendix. Organization could oblige them to do this and thus sharpen their sense for diagnosis, and contribute to science as well.

When we now turn to the *causes of failure due to the patient*—his enfeebled condition, his advanced disease, or his obstinate refusal to cöoperate in treatment—we must turn to public education for the remedies.

For instance, some of the practitioners of this community still give purgatives for acute abdominal conditions and wait until these have failed before calling a surgeon or sending the case to a hospital. Many of the failures of acute appendicitis are due to this cause. Why should not the hospital notify the physician of his share in the responsibility for such failures? This could be done without offence by an efficiency committee.

When we consider the patient's disease, the value of

publicity goes beyond the physician to the patient. Nearly twenty per cent of our cases were neglected cancer of one organ or another. Why should not the prominent hospitals of a community issue a bulletin describing the early symptoms of cancer? Let the community know that when people past middle life have loss of weight without known cause they should consult their physician; that lumps in the breast, irregular menstruation, distaste for food, constipation or diarrhea replacing life-long regularity of the bowels, are respectively early symptoms of cancer of the breast, uterus stomach, and intestine.

In cases where a patient refuses treatment, and it is clear that such treatment is necessary, it must always be remembered that where one personality fails with the patient, another may succeed.

THE CALAMITIES OF SURGERY

If we admit that these are beyond our control, the patient and the public have as much right to knowledge of them as has the medical profession. That sudden death may exceptionally follow the injection of diphtheria antitoxin, that trivial operations may be fatal in the presence of the status lymphaticus, that pulmonary embolism occasionally occurs after surgical operations, and that other unexpected disasters are not unknown in medical practice, are facts which should be acknowledged and faced. The percentage of their occurrence in the big hospitals should be known, and every effort should be made to find the means of their prevention. In the case of pulmonary embolism, for instance, there must be some matter of technique in the handling of the wound which is responsible for its occurrence. This is a good subject for a scholarship or a prize essay research, or for investigation by some ambitious young surgeon who seeks promotion.

It may seem to some of the readers of these remarks that many of the facts that have been mentioned should be the property of the medical profession and not of the lay public. This would be the view of the older members of the profession who have not yet felt the change that has come about in recent years in the matter of publicity of medical and surgical experience. Now that the latest operation has become dinner-table conversation and forms a considerable part of the entertaining news among all classes, much of the humbug of medical practice is passing away. The entrance of many women of the better classes into social service and other philanthropic work is another factor which makes it necessary for the modern medical man to stick as closely as possible to facts in his statements to his patients.

There is also a definite change in the sentiment of the insurance companies toward the physician. The workman's compensation act makes it a matter of dollars and cents to put the sick or injured workman back as a wage-earner as soon as possible. The agents of insurance companies are already differentiating between one hospital and another, according to the actual service that can be rendered to their client. They are beginning to have a disrespect for the old-fashioned sentimentality and so-called ethical rules of the profession. The writer believes that it is time for the hospitals of the country to realize that they must conduct their affairs on a basis of actual accomplishment rather than on the old basis of having "successful practitioners" honor them by their shields of social reputation.

CONCLUSION

There are many corollaries to this theory of hospital management. It is at once obvious that this method makes it necessary to assign the cases to the members of the staff according to the actual ability of the individual members to

successfully deal with the type of case in question. Assignment of the different cases by the calendar of by seniority alone must be abandoned. Likewise promotion which takes into consideration demonstrated success in treatment must supplant promotion by seniority or social or political influence.

It will no longer be possible for surgeons to hold hospital positions merely to increase their prestige for private practice. To hold their connection with the hospital as they grow older they must specialize more and more in the branches for which their peculiarities of skill or temperament actually fit them, and they must hold their title to do even these cases against the aggressive study of some junior who is assigned to be the substitute for them when not on duty.

It means, too, opportunity for the young surgeon to do many of the operations which at most hospitals his senior does now, and it means graduate instead of student assistance for the most difficult cases.

It means that the trustees of hospitals must admit it as a part of their duty to see that some investigation is made as to the quality of the product which their hospital factories give to the public.

It means that the surgeons at the smaller suburban non-teaching hospitals should be compelled to train their judgment by avoiding cases which are likely to lead to unfavorable results.

It means regular visits to such hospitals by consulting surgeons from neighboring medical centres, or else beaten paths by which difficult cases are transferred to medical centres.

It means a more careful distribution of cases among all the hospitals of the community.

Conversely it means the recognition of able surgeons in local hospitals and the demand for such individuals in medical centres. It also means the refusal by the great central

hospitals of the cases which can be perfectly well done by the local operators.

Another corollary is the establishment of standards in the more definite classes of cases, as the writer has already pointed out in a paper on ninety-eight consecutive cases of appendicitis, in which a standard was set as follows:

Mortality	0
Diagnostic errors	39 per cent.
Failure of first intention, etc.	18 per cent.

These errors were academic rather than practical, but were of vital importance if we are to pretend to make a science of clinical surgery. The 39 per cent. of diagnostic errors did no harm, nor did the failure of first intention, except for a delay of canvalescence in two cases. But the fact that no more pathologic appendices are found in a series of "interval appendices" than are found in an equivalent number of laparotomies for other causes shows that our standard of diagnosis is a low one and needs further attention.

The establishment of standards will react on private practice so that the public will learn how to seek competent help in all branches of medicine and surgery, and will be able to obtain that help at reasonable rates.

In the opinion of the writer the time must come when the great hospitals must advertise truthfully the skill which is possessed by the members of their staffs. Already it is customary to have a hospital position considered by the laity as a guarantee of a high standard of work, and *vice versa*. The time will soon come when the hospital in its turn will demand of the members of its staff proof of their right to hold their positions.

It is the intention of this hospital to carry out its work on the basis of the end result system, and to refer to other surgeons who have demonstrated higher standards of efficiency any cases which demand superior skill to that which we have demonstrated.

We do not enter into competition with more skillful surgeons for cases among the well-to-do classes, but for cases of moderate means we offer an opportunity to get surgical service of a high standard at prices but little above our actual cost for maintenance.

If enough general practitioners will stand by us in this endeavor to introduce fair play into surgery, we believe that even our modest competition may in time force the large hospitals into conducting their surgical departments on the simple series of questions:

What was the matter?

Did they find it out beforehand?

Did the patient get entirely well?

If not—why not?

Was it the fault of the surgeon, the disease, or the patient?

What can we do to prevent similar failures in the future?

In our charitable hospitals it is the duty of no person or department to ask these questions. It is a disagreeable duty which neither the staff nor the board of trustees nor the superintendent has the strength to assume alone. An efficiency committee composed of members of each of these departments should assume this burden. The coöperation of the board of trustees is necessary both to authorize the expense and to guarantee the standard of the work reported.

Even if a detailed report is not published, a typewritten. review should be kept for the use of the efficiency committee.

When this step is taken by our great hospitals, true clinical science will begin.

DISCUSSION ON THE PAPERS OF DRS. DICKINSON AND CODMAN

Dr. Edwin B. Cragin (by title).—Hospital efficiency measured in terms of product means accomplishment of the greatest amount of work with the least amount of friction.

Friction then should be one of the first handicaps a hospital should seek to eliminate, and the first element of friction to which I shall call attention is that which sometimes exists between the Board of Managers and the Medical Board or Medical Officers of the hospital. This friction is usually due to misunderstandings which could easily be cleared provided the medical staff was represented by one or more of its members on the Board of Managers. It is not feasible in every hospital to imitate the conditions present in the institution which it is my privilege to serve, where the attending surgeon is the President of the Board of Managers and yet the smooth working of that system has demonstrated the absence of friction when hospital problems are freely discussed from the view-point both of the attending staff and the Board of Management.

Another condition avoiding friction and promoting hospital efficiency is a single-headed continuous service. In no other way can so deep an interest in a hospital service be developed and in no other way can an attending surgeon be brought to feel so keenly his responsibility alike for the welfare of the institution and the patients. The single-headed continuous service of course implies an able assistant with sufficient training and experience to enable him to serve as acting head in all emergencies and during the absence of his chief.

With its Board of Managers and its attending staff thus organized the following factors in hospital efficiency deserve emphasis:

1. The care of the sick.
2. The training of nurses.
3. The teaching of internes and students.
4. The teaching of the profession.
5. Social service.

First of all must stand as the chief object of every hospital the skilful care of the sick and in calling attention to the possible development of other factors in hospital efficiency, this first must not be forgotten. Patients, whether medical, surgical, or obstetrical may be used for the teaching of nurses, internes, students, and practitioners only insofar as it does not interfere with their most skilful and humane treatment. A modern hospital is not only dependent for its success and efficiency on its corps of trained nurses, but is under obligation

to use its facilities in giving its nurses the best possible training for their life-work. This can best be accomplished by hearty coöperation between the chief attending and the Principal of the Training School. No hospital today is making the most of its opportunities unless it is regarded both by its Board of Managers and its attending staff as a teaching institution as well as an institution for the care of the sick. It has been clearly demonstrated that during the last few years in a hospital connected with a medical school not only can the opportunities for the study of medical, surgical, obstetrical, and pathological conditions be made use of by graduates in medicine, but that undergraduate students may, without injury to the patients, not only gain great advantage from the hospital but be of great advantage to the hospital. That this advantage to the hospital is coming to be appreciated is shown by the fact that of late at the College of Physicians and Surgeons, New York, more hospitals have applied for medical clerks and surgical dressers than we have been able to accommodate.

These undergraduate students are of advantage to the hospital in stimulating both internes and attending staff to the highest class of work in diagnosis, prognosis, and treatment. Medical clerks and surgical dressers are critical, and student criticism is often helpfully stimulating.

Another phase of hospital efficiency is that of educating the profession. The special privilege of a large medical or surgical service carries with it an obligation to give to those of the profession not thus favored the results of the treatment of larger series of cases than can be observed in private practice. This implies careful histories and careful following of the cases as far as possible after they leave the hospital, as for instance, records of the condition three months and a year after leaving the institution. In this way the permanent results may be tabulated and the relative value of different operations be determined.

No hospital makes the most of its opportunities today unless it is equipped for more or less work along the lines of social service. The duplication of charitable organizations already in existence in the same town is unwise, but no hospital is thoroughly efficient today which discharges a homeless, helpless patient, whether man, woman, or child without first putting that patient in touch with that organized charity which is

best equipped for dealing with that need. Thus far my remarks have been applicable to the general hospital. The problem may now be made more concrete. How can the American Frauenklinic be made efficient? The trend of medical schools throughout the country seems to be to unite the chairs of Obstetrics and Gynecology under one head and to own or control near at hand a Frauenklinic to which the head of the department shall devote the most of his time. In my own judgment the best teacher of a practical subject like obstetrics is one who keeps in touch with private practice. This means having private obstetric cases go to the hospital. The consulting rooms may be located either in the hospital or in the home of the obstetrician, according to the convenience of location, but the private work in both obstetrics and gynecology can be chiefly done in the hospital and with little conflict between the two. It has been argued that the upper classes will not go to a hospital for their confinements. The speaker, from practical experience, is able to refute this argument. Two things alone are essential: Attractive private rooms and education of the laity in the advantages of hospital care. With a well-equipped Frauenklinik, with the head of the institution devoting most of his time to it and with careful attention to the important factors of hospital efficiency which have been emphasized there is presented a standard which may well be aimed at.

Dr. Philander A. Harris.—With reference to the potentiality for efficiency, there is no doubt that Dr. Dickinson has struck a note which should resound and have a far-reaching effect. Take the matter of nurses; in New Jersey we have a little over 1,000,000 people in what we call the metropolitan district, and when we add the suburb of Newark, we have 5,000,000 or 6,000,000 of people, consequently a great many hospitals. In these hospitals it has been the fashion of late for the superintendent of nurses to print the nurses' notes of cases. I do not know whether that plan prevails in Boston or not. I found this plan introduced in one of the hospitals where I visited. I found it introduced also in another hospital where I regularly attend gynecological cases, and I said to a nurse, "How do you like this?" She replied, "I think the sheet looks nice, but it takes a great deal of time." I said to her, "You can write, can you not?" "Yes." I asked her to write her opinion of this plan in her own handwriting to see whether her

writing was legible or not, and she at once did so. I found that her writing was only fairly legible.

It seems to me when we allow the nursing system to go to work and print the nurses' notes and take unnecessary time they should show us the advantage of it. I have never been able to read the bedside notes of any nurse who was graduated from a hospital.

To get down to the question of efficiency, about eighteen years ago I discovered that a patient had bled to death after an abdominal section, and then it occurred to me that observations of the pulse were not made often enough; so at that time I wrote down a standing instruction to the effect that the pulse must be taken every twenty minutes if the pulse rate gets to be twenty beats faster than it was after operation, and that then the one who operated should be notified. I added to this standing instruction from time to time as applying to my gynecological service. These instructions were left with the heads of divisions and worked very well. Then I came out with a second edition, a third, and finally a fourth edition, and it was always written on the top, "Standing instructions. These only apply to the gynecological service of Dr. Harris." These instructions consisted of certain things to be done under certain conditions. These instructions grew until the nursing in the hospital was controlled by them. One of the hospitals carried out these standing instructions as a labor-saving proposition because it took care of the more important things which were necessary for nurses to do under certain conditions.

I think that the duplication and reduplication of effort with the coming in of a new superintendent of nurses and changing the regime is an absolute waste of time. While doubtless this system could be improved, yet if a staff of twelve people would unanimously adopt this system I am sure they would appreciate the fact that these instructions are labor-saving.

Dr. Le Roy Broun.—Dr. Dickinson referred to the Associated Out-patient Clinics of New York, and what we have been trying to do. This association is composed of representatives of almost all of the clinics of New York City. The association meets annually and also on call. The executive committee, of which I have been a member, meets monthly and has a paid executive secretary who gives his entire time to the work in hand. A great deal of work has been done and much time and earnest

thought have been given to the free clincial problem of New York City.

One part of the work has been that of organizing the various departments of medicine and surgery into associations as the Associated Gynecological Out-patient Clinics, the Associated Genito-urinary Out-patient Clinics, Pediatric, Surgical, etc.

At the request of the parent association the associated specialties have after considerable labor drawn up a common history card for each specialty to be used throughout all the clinics in the city. They have also submitted what in their opinion ahould be the essential clinical equipment for each branch.

The recommendations represent much thought and the experience of able men. The recommendations together with the approved common history card were forwarded to the heads of every clinic in the city, with the urgent request from the parent association that they should be adopted in order that the best results could be obtained.

While in every instance this request was favorably received, in no instance, so far as I know, have they been put into effect. All of our efforts have been pigeon-holed, and I am afraid they may stay there.

The only practical way in which I feel we can get the results we wish is to have all the clinics of the city responsible in a degree to the local Board of Charities. That such a board in recognizing this responsibility should compensate the clinics by paying into their treasury a yearly sum based on the per capita attendance. Such an arrangement is equable, since it transfers the cost of the care of the sick poor to the entire population of the city and not have it borne as at present by the managers of the various hospitals.

If hospitals and clinics should receive such a per capita allowance the local board of charities could and would through such a body as the Associated Out-patient Clinics demand that a common history card be adopted and carefully kept, and that such clinics must afford every applicance needed for thorough and accurate work.

So long as the majority of the large cities clinics are independent and have no responsibility to a common governing board, just so long will there be a lack of united work. Introduce the money compensation to the managers of the clinics. Form such a governing board and it will be easy to bring about the reforms that we are so anxious to put into force.

A CRITICAL REVIEW OF FIVE HUNDRED PUBLISHED AND UNPUBLISHED CASES OF ABDOMINAL CESAREAN SECTION FOR ECLAMPSIA

By Reuben Peterson, M.D.
Ann Harbor, Mich.

Three years ago I laid before this Society the results of an analysis of 530 published and unpublished cases of eclampsia treated by vaginal Cesarean section. Even if the conclusions of this paper have not been accepted in their entirety, at least their presentation has given rise to free discussion and in that way good has resulted. For the past three years I have been engaged in collecting published and unpublished cases of eclampsia treated by abdominal Cesarean section in order that I might be in a position to study carefully the results of this method of treating eclampsia. The work was begun with no idea of proving or disproving the value of this operative procedure in eclampsia. It was proposed to make it a study, an impartial analysis of cases where the uterus had been emptied by the suprapubic route either in the interest of the eclamptic woman or her child. This should be clearly understood at the outset, for the value of the work will depend largely upon how the cases have been collected and whether they have been studied with an unbiased mind. Everyone knows how easy it is to prove or disprove anything by statistics, and because this is resorted to so frequently by violent partisans a doubt has arisen as

to the value of medical statistics. This is a mistake, in my opinion, for an impartial scientific statistical study of any medical topic is exceedingly valuable and well-nigh indispensable in judging of the value of certain lines of treatment.

The same method was employed in the collection of the present series of cases as was used in preparing the article on vaginal Cesarean section. Letters were sent to prominent obstetricians, gynecologists, and surgeons in this country and abroad stating the purpose of the research work and requesting the privilege of including in the statistics any cases of eclampsia in which abdominal Cesarean section had been performed. In addition, the letters stated that the writer would consider it a favor to be referred to any one who had had occasion to treat ecampsia by this method. Through the kindness and courtesy of many correspondents I have been able to gather together for statistical purposes 500 published and unpublished cases of abdominal Cesarean section for eclampsia. When this number was reached the polls were closed, so to speak, in order that the cases could be analyzed and conclusions drawn from such analysis. Otherwise the number could have been indefinitely augmented, since at the present time the operation is far more frequently performed than was the case a few years ago.

OPERATORS FROM THE UNITED STATES

No.	Name.	Address.	Cases. Published.	Unpublished.	Total.
1	Allen, L. M.	Winchester, Va.	0	1	1
2	Anderson, M. L.	Richmond, Va.	0	1	1
3	Arp, A. H.	Moline, Ill.	0	1	1
4	Austin, O. L.	Tuckahoe, N. Y.	0	2	2
5	Baldwin, J. F.	Columbus, O.	0	2	2
6	Barkley, A. H.	Lexington, Ky.	0	5	5
7	Barlow, O. H.	Norfolk, Va.	0	1	1
8	Boldt, H. J.	New York City	1	0	1
9	Boyd, G. M.	Philadelphia, Pa.	1	0	1
10	Brand, W. W.	Toledo, O.	0	1	1
11	Brent, H. W.	Baltimore, Md.	0	1	1

OPERATORS FROM THE UNITED STATES (*Continued*)

No.	Name.	Address.	Cases. Published.	Unpublished.	Total.
12	Bromberg, P.	Nashville, Tenn.	0	1	1
13	Brothers, A. (Deceased)		1	0	1
14	Brown, D. J.	Springfield, Mass.	0	13	13
15	Bryan, W.	West New Brighton, N. Y.	0	3	3
16	Buechner, W. H.	Youngstown, O	0	2	2
17	Bullock, W. O.	Lexington, Ky.	0	1	1
18	Burch, L. E.	Nashville, Tenn.	0	1	1
19	Burns, T. M.	Denver, Colo.	5	3	8
20	Cannon, W. T.	Salt Lake City, Utah	0	1	1
21	Carr, W. P.	Washington, D. C.	0	4	4
22	Chandler, T. E.	Boston, Mass.	0	3	3
23	Clark, J. R.	San Francisco, Cal.	0	1	1
24	Cole, C. G.	New Orleans, La.	0	1	1
25	Coleman, D.	Richmond, Va.	0	1	1
26	Collins, C. U.	Peoria, Ill.	0	1	1
27	Connell, F. G.	Oshkosh, Wis.	0	1	1
28	Craig, W. B.	Denver, Colo.	0	4	4
29	Crisler, J. A.	Memphis, Tenn.	0	1	1
30	Davis, A. B.	New York City	0	11	11
31	Davis, E. P.	Philadelphia, Pa.	2	3	5
32	De Lee, J. B.	Chicago, Ill.	0	1	1
33	Denny, D. W. C. (Deceased)		1	0	1
34	Fitch, J. W.	Portsmouth, O.	0	1	1
35	Foster, T. A. (Deceased)		1	0	1
36	Frederick, C. C. (Deceased)		1	0	0
37	Friedman, L. V.	Boston, Mass.	0	1	1
38	Gamble, H. F.	Charleston, W. Va.	1	0	1
39	Gessner, H. B.	New Orleans, La.	0	1	1
40	Green, C. M.	Boston, Mass.	0	2	2
41	Gunther, E. E.	Newark, N. J.	0	2	2
42	Haggard, W. D.	Nashville, Tenn.	2	0	2
43	Harrar, J. A.	New York City.	0	1	1
44	Harrison, T. L.	Drewsey, Ore.	1	0	1
45	Hasbrouck, E. M.	Washington, D. C.	0	1	1
46	Hill, R. S.	Montgomery, Ala.	0	1	1
47	Hipke, G. A.	Milwaukee, Wis.	0	3	3
48	Hirst, B. C.	Philadelphia, Pa.	0	2	2
49	Hoffman, L. H.	San Francisco, Cal.	1	1	1

OPERATORS FROM THE UNITED STATES (*Continued*)

No.	Name.	Address.	Cases. Published.	Unpublished.	Total.
50	v. Hoffmann, C.	San Francisco, Cal.	0	1	1
51	Holmes, R. W.	Chicago, Ill.	0	1	1
52	Hooe, A. B.	Washington, D. C.	0	1	1
53	Horsley, J. S.	Richmond. Va.	0	2	2
54	Hotaling, A. S.	Syracuse, N. Y.	1	1	2
55	Howard, C. T.	Boston, Mass.	0	1	1
56	Howell, C. A.	Columbus, O.	0	1	1
57	Huggins, R. R.	Pittsburgh, Pa.	0	1	1
58	Humphrey, W. A.	Toledo, O.	0	1	1
59	Hussey, A. A.	Brooklyn, N. Y.	0	1	1
60	Ill, C. L.	Newark, N. J.	1	12	13
61	Ill, E. A.	Newark, N. J.	0	1	1
62	Ill, E. J.	Newark, N. J.	0	6	6
63	Jack, W. A.	Washington, D. C.	0	1	1
64	Jackson, F. H.	Houlton, Me.	1	0	1
65	Jackson, J. N.	Kansas City, Mo.	0	1	1
66	Johnson, S. H	Bellingham, Wash.	1	1	2
67	Johnston, G. B.	Richmond, Va.	1	4	5
68	Johnston, W.	Richmond, Va.	1	4	5
69	Kelley, J. T.	Washington, D. C.	0	1	1
70	Knapp, C. B.	New York City	0	1	1
71	Kohlman, W.	New Orleans, La.	0	1	1
72	Kreutzmann, H. J.	San Francisco, Cal.	0	1	1
73	Lynch, C. F.	Springfield, Mass.	0	3	3
74	Mac Lean, H. S.	Richmond, Va.	0	5	5
75	Macrae, D.	Council Bluffs, Ia.	0	3	3
76	Maguire, D. L.	Charleston, S. C.	0	1	1
77	Mann, H.	Richmond, Va.	0	1	1
78	Markoe, J. W.	New York City	0	9	9
79	Marsh, J. P.	Troy, N. Y.	3	1	4
80	Martin, P. F.	Indianapolis, Ind.	1	0	1
81	Matthews, O. H.	Atlanta, Ga.	0	1	1
82	McGuire, S.	Richmond, Va.	0	1	1
83	McPherson, R.	New York City.	0	1	1
84	Means, W. J.	Columbus, O.	0	1	1
85	Morris, L. C.	Birmingham, Ala.	0	1	1
86	Mullally, L.	Charleston, S. C.	2	4	6
87	Nason, F. T.	McKeesport, Pa.	0	14	14
88	Neale, L. E.	Baltimore, Md.	0	3	3
89	Norris	Toledo, O.	0	1	1
90	Norris, R. C.	Philadelphia, Pa.	0	1	1
91	Painter, H. McM.	New York City.	0	1	1
92	Perkins, J. W.	Kansas City, Mo.	0	1	1

OPERATORS FROM THE UNITED STATES (*Continued*)

No.	Name.	Address.	Cases. Published.	Unpublished.	Total.
93	Peterson, R.	Ann Arbor, Mich.	0	1	1
94	Poucher, J. W.	Poughkeepsie, N. Y.	1	0	1
95	Prince, E. M.	Birmingham, Ala.	2	1	3
96	Redmon, L. C.	Lexington, Ky.	0	2	2
97	Reid, W. B.	Rome, N. Y.	1	0	1
98	Richmond, J. L. (Deceased)	. . . . .	1	0	1
99	Rickette, B. M.	Cincinnati, O.	0	1	1
100	Robbins, C. R.	Richmond, Va.	0	3	3
101	Sanders, St. E.	Kansas City, Mo.	0	1	1
102	Schaefer, C. R.	Indianapolis, Ind.	1	0	1
103	Schell, J. T.	Philadelphia, Pa.	1	0	1
104	Schell, W.	Terre Haute, Ind.	1	0	1
105	Schoolfield, G. C.	Charleston, W. Va.	0	1	1
106	Seelye, R. H.	Springfield, Mass.	0	1	1
107	Sherbondy, J. A.	Youngstown, O.	0	1	1
108	Skeel, R. E.	Cleveland, O.	1	1	2
109	Slemons, J. M.	Baltimore, Md.	0	2	2
110	Smith, R. K.	San Francisco, Cal.	0	1	1
111	Smith, Wayne	St. Louis, Mo.	0	2	2
112	Smith, Willard	Phoenix, Ariz.	1	0	1
113	Stafford, S. W.	New Orleans, La	0	1	1
114	Stillwagen, C.	Pittsburgh, Pa.	2	0	2
115	Stone, I. S.	Washington, D. C.	0	1	1
116	Supple, E. A.	Boston, Mass.	0	3	3
117	Sweet, F. B.	Springfield, Mass.	0	2	2
118	Todd, G. M.	Toledo, O.	0	4	4
119	Truesdell, E. D.	New York City	0	1	1
120	Van Sweringen B	Fort Wayne, Ind.	1	1	2
121	Wallace, W. L.	Syracuse, N. Y.	0	1	1
122	Watkins, J. T.	Chicago, Ill.	0	1	1
123	Weller	Toledo, Ohio	0	1	1
124	Wesselhoeft, C.	Boston, Mass.	0	1	1
125	Williams, D. H.	Dallas, Tex.	1	0	1
126	Williams, E. M.	Patterson, La.	0	5	5
127	Williams, J. W.	Baltimore, Md.	0	2	2
128	Wilson, K. M.	Baltimore, Md.	0	1	1
129	Woodbury, F. T.	Fort Screven, Ga.	2	0	2
130	Wysor, J. C., and Ayers, E. A.	Cliftonforge, Va.	1	0	1
131	Zimmermann, V. S.	Brooklyn, N. Y.	0	1	1
	Total		46	230	276

OPERATORS FROM GERMANY

No.	Name.	Address.	Cases. Published.	Unpublished.	Total.
1	Alsberg, P.	Charlottenburg b.	2	0	2
2	Biermer, R.	Wiesbaden	1	0	1
3	Burmeister, T.	Stettin	1	0	1
4	Czempin, A.	Berlin	1	0	1
5	Dauber, H.	Würzburg	1	0	1
6	Dienst, A.	Oppeln	3	0	3
7	Döderlein, A.	München, Bayern	1	2	3
8	Dorff (Deceased)		1	0	1
9	Engelmann, F.	Dortmund	2	2	4
10	Esch, P.	Marburg	3	0	3
11	Everke C.	Bochum, Westphalen	9	3	12
12	Fehling, H.	Strassburg, i/E	1	2	3
13	Frank, F.	Köln, a/Rh	2	0	2
14	Freund, H.	Strassburg, i/E	1	1	2
15	Friedmann, B.	See bibliography	1	0	1
16	Friedmann, G.	Stettin	1	0	1
17	Glaser	Frankfurt, a/M	1	0	1
18	Götze, A. (Deceased)		1	0	1
19	Goldberg, O.	Dresden	1	0	1
20	Gottschalk, O	Berlin	1	0	1
21	Graefe, M.	Halle, A/S	1	0	1
22	Griesel, M.	Jena	2	0	2
23	v. Guérard, H. A. (Deceased)		1	0	1
24	Gusserow (Deceased)		1	0	1
25	Haindl, G.	Erlangen	1	0	1
26	Hammerschlag, S.	Berlin	2	0	2
27	Hartwig	Hanover	2	0	2
28	Heinze, H.	Breslau	1	0	1
122	Watkins, J. T.	Chicago, Ill.	0	1	1
29	Henkel, M.	Jena	0	5	5
30	Herrenschneider	Kolmar	1	0	1
31	Hildebrandt	Lüneberg	1	0	1
32	Hilmann, H.	Jena.	1	0	1
33	Kalisch	See bibliography	1	0	1
34	Kaltenbach (Deceased)		1	0	1
35	Klein G.	München, Bayern	1	0	1
36	Kroemer	Berlin	1	0	1

OPERATORS FROM GERMANY (*Continued*)

No.	Name.	Address.	Cases. Published.	Unpublished.	Total.
37	Küstner, O.	Breslau	6	0	6
38	Kupferberg, W.	Mainz	0	1	1
39	Laubenburg, K. E.	Remscheid	1	2	3
40	Leopold, G. (Deceased)		1	0	1
41	Loewnstein, H.	Frankfurt, a/M	2	0	2
42	Martin, A.	Berlin	1	0	1
43	Meller, J.	Würzburg	1	0	1
44	O. R.	See bibliography	1	0	1
45	Oldeystella, J.	Leipzig	0	1	1
46	Olshausen, R.	Berlin	3	0	3
47	Opitz, E.	Düsseldorf	1	1	2
48	Pomy, L.	Göttingen	3	0	3
49	Poten	Hanover	1	0	1
50	Runge, E.	Berlin	2	0	2
51	Schatx	Rostock, i/M	1	0	1
52	Schmidt	See bibliography	1	0	1
53	Schreiber, G.	Rodheim, v. d. H.	1	0	1
54	Schütte	Gelsenkirchen, Westphalen.	1	0	1
55	Seiffert, H.	Nordhausen	2	0	2
56	Seitz, L.	München, Bayern	2	0	2
57	Simrock, E.	Frankfurt, a/M	1	0	1
58	Sippel, A.	Frankfurt, a/M	1	0	1
59	Staude	Hamburg	1	4	5
60	Steinbrecher	See bibliography	1	0	1
61	Strassmann, P.	Berlin	1	0	1
62	Stumpf, M.	München, Bayern.	1	0	1
63	v. Swiecicki, H.	Posen	1	0	1
64	Veit, J.	Halle, a/S	1	4	5
65	Walcher, G.	Stuttgart, Würtemberg.	1	0	1
66	Wanner, R.	Düsseldorf	1	0	1
67	Zweifel, P.	Leipzig	1	5	6
	Total		95	33	128

OPERATORS FROM THE NETHERLANDS

1	Van den Akker	See bibliography	1	0	1
2	Halbertsma, T.	Utrecht	4	0	4
3	Hefting, J. D.	Amsterdam	1	0	1
4	van der Hoeven	Leyden	1	0	1

OPERATORS FROM THE NETHERLANDS (*Continued*)

No.	Name.	Address.	Cases. Published.	Unpublished.	Total.
5	Kefting,	Eeurem	1	0	1
6	Kramer, A. J. H.	Eindhoren	1	0	1
7	Metzlar, C.	Apeldoorn	1	0	1
8	van der Mey (Deceased)		1	0	1
9	Nijhoff, J. C.	Groningen	0	1	1
10	van de Poll, C. N.	Amsterdam	1	0	1
11	Reijenga, J.	Groningen	1	0	1
12	Ribbius, P.	Arnhem	1	1	2
13	Risseeuw, A. J.	Haarlem	4	0	4
14	Trenite, N. A. H.	The Hague	1	0	1
15	Treub, H.	Amsterdam	1	0	1
	Total		20	2	22

OPERATORS FROM AUSTRIA

1	Bäcker, J.	Budapest	1	0	1
2	Braun, G. (Deceased)		1	0	1
3	v. Braun-Fernwald, R.	Wein	1	0	1
4	Neumann, J.	Wien	2	0	2
5	Ostreil, A.	Prag	1	0	1
6	v. Rosthorn (Deceased)		1	0	1
7	Rotter, H.	Budapest	1	0	1
8	Schauta, F.	Wien	1	0	1
9	Wertheim, E.	Wien	2	0	2
	Total		11	0	11

OPERATORS FROM SWITZERLAND

1	Brunner, C.	Münsterlingen	2	0	2
2	v. Herff, O.	Basel	1	0	1
3	Müller, P.	Bern	2	10	12
4	Rossier, G.	Lausanne	1	0	1
5	Weber, E.	Bern	1	0	1
6	Wegelin, C.	Bern	1	0	1
	Total		8	10	18

OPERATORS FROM RUSSIA

No.	Name.	Address.	Cases. Published.	Unpublished.	Total.
1	Beckmann, W.	St. Petersburg	0	2	2
2	Keyserlingk, R. B.	Reval	1	0	1
3	Knüpffer, A.	Reval	1	0	1
4	Michailoff, N.	Rostow, a/D	0	8	8
5	Pobjedinski, N.	Moscow	2	0	2
6	Sewilugo, N. S.	See bibliography	2	0	2
	Total		6	10	16

OPERATORS FROM ITALY

1	Balatresi, U.	See bibliography	1	0	1
2	Bidone, E.	Bologna	1	0	1
3	Caruso, F.	Catania	1	0	1
4	Coen	See bibliography	1	0	1
5	Decio, C.	Milan	1	0	1
6	Montini, A.	Seregno	1	0	1
	Total		6	0	6

OPERATORS FROM SWEDEN

1	Essen-Möller, E.	Lund	1	0	1
2	Lennander, K. E. (Deceased)		2	0	2
3	Lundblad, O.	Vänersborg	2	0	2
4	Salin, M. J.	Stockholm	1	0	1
	Total		6	0	6

OPERATORS FROM ENGLAND

1	Favell, R.	Sheffield	1	0	1
2	Maxwell, R. D.	London	1	0	1
3	McCann, F. J.	London	1	0	1
4	Walls, W. K.	Manchester	1	0	1
	Total		4	0	4

OPERATORS FROM SCOTLAND

1	Croom, J. H.	Edinburgh	1	0	1
2	Croom, Sir H.	Edinburgh	1	0	1
3	Morison, A. E.	Sunderland	1	0	1
4	Russell, A. W.	Glasgow	1	0	1
	Total		4	0	4

OPERATORS FROM IRELAND

No.	Name.	Address.	Cases. Published.	Unpublished.	Total.
1	Magure, K. M. N.	Dublin	1	0	1
2	Smyly, Sir W.	Dublin	1	0	1
	Total		2	0	2

OPERATORS FROM FRANCE

1	Bonnaire, E.	Paris	1	0	1
2	Paucot, H., and Leclercq.		1	0	1
	Total		2	0	2

OPERATORS FROM CANADA

1	Reddy, H. L.	Montreal	1	2	3
	Total		1	2	3

OPERATORS FROM AFRICA

1	Klots, P. S.	Transvaal	1	0	1
	Total		1	0	1

OPERATORS FROM AUSTRALIA

1	Batchelor, F. C.	See bibliography.	1	0	1
	Total		1	0	1

Total number of published cases	213
Total number of unpublished cases	287
Total number of cases	500

CASES

	Published.	Unpublished.	Total.
United States	46	230	276
Germany	95	33	128
Netherlands	20	2	22
Austria	11	0	11
Switzerland	8	10	18
Russia	6	10	16
Italy	6	0	6
Sweden	6	0	6
England	4	0	4
Scotland	4	0	4
Ireland	2	0	2
France	2	0	2
Canada	1	2	3
Africa	1	0	1
Australia	1	0	1
Total	213	287	500

OPERATORS

United States	131
Germany	67
Netherlands	15
Austria	9
Switzerland	6
Russia	6
Italy	6
Sweden	4
England	4
Scotland	2
Ireland	2
France	2
Canada	1
Africa	1
Australia	1
Total	257

As in the former paper, no case was included in the list where there was not at least one distinct eclamptic seizure. This criterion was established not to emphasize the importance of the eclamptic convulsion, but for the purpose of having some standard to go by. For obviously it would have taken us too far afield to include in the list cases where the operation had been performed for the toxemia of pregnancy.

The operators have been listed according to their nationalities and their published and unpublished cases also have been listed. It has been thought best to give the addresses of the individual operators as accurately as possible, as an aid to future investigators. Where it has been impossible to obtain the addresses, the article in which the case was reported can be found in the bibliography.

In spite of the fact that more than one-half of the cases, 276 out of 500, were performed by American operators, it is not safe to conclude that relatively abdominal Cesarean section is performed more frequently for eclampsia in this country than abroad, since naturally my requests for unpublished cases were complied with more generally in this country. Germany, for instance, furnished over twice as many pub-

lished cases as did America, 95 as against 46, yet only 33 unpublished cases were sent me by German operators.

Of especial interest is the fact that the 500 cases of abdominal Cesarean section for eclampsia represented the work of 259 operators. In other words, the operations were performed not by a few men with large clinical material to draw from and with the skill that comes from unusual opportunites, but by many operators from many countries. This after all is a far better index of the value of an operative procedure for a certain condition than where many operations are confined to a few men whose results perhaps the average surgeon would have difficulty in equalling. For any line of treatment in eclampsia to be of any value must be within the reach of the great body of practitioners, since they see the eclamptic first and must either carry out the treatment or call in someone to do it for them.

The maternal mortality.

Since it is generally agreed that the interests of the mother take precedence over those of her child in a case of eclampsia, it seems fitting that the maternal mortality resulting from the series should be first considered. But I have come to the conclusion that, in all fairness to any operative procedure in eclampsia, the mortality must be arrived at in such a manner as to show its true value. I mean by this that today we are only interested historically in the results obtained by abdominal Cesarean section for any obstetric condition when the operations were performed before the days of asepsis or before obstetricians began to realize the operation under discussion could not be performed safely if prior attempts had been made to deliver by the natural passages.

Obstetrics in general and obstetric surgery in particular have been slow to respond to the great advances in surgical technique which have taken place during the past thirty years. It is a matter of common knowledge that the operator who is most painstaking in the aseptic technique of his abdominal

and plastic work will be guilty of the greatest carelessness in his obstetric surgery. This lack of care is an undesirable inheritance from a host of obstreticians who were not trained in surgical technique, since their surgical experience was limited to this one field. While many deaths resulted from poor technique, so great was the natural resistance of the parturient woman that the mortality from sepsis did not reach alarming proportions so long as the operative procedures were from below, in other words, if the peritoneal cavity were not invaded. But it was another story when this happened. Then the mortality was very high, for the peritoneum, contaminated by puerperal septic organisms, became rapidly the seat of general inflammation and death resulted from peritonitis.

Since abdominal Cesarean section involves the opening of the peritoneal cavity it is obviously unfair to include in the mortality figures, except for comparison, patients operated by this method before the days of asepsis or before obstetricians realized the contraindications to the operation from the standpoint of sepsis. If such cases are included in the statistics, the figures do not show the results of the treatment of eclampsia by abdominal Cesarean section, but the results of such operative treatment plus sepsis, which places the mortality far higher than it should be.

In addition, it must be understood that a small number of cases is of little avail so far as statistics are concerned. Results obtained from the treatment of a few cases may be far different when more patients are subjected to the same treatment. For this reason among others, I have waited before publishing results until conclusions could be drawn from hundreds and not dozens of cases.

For the reasons outlined above I have divided the 500 cases chronologically into two groups: first, those occurring prior to 1908, and second, those operated upon between 1908 and 1913. The latter period was selected only because it

furnished the requisite number of cases from which to draw conclusions and for no other purpose.

Between 1908 and 1913 there were 283 cases of antepartum eclampsia where the uterus was emptied by abdominal Cesarean section with 73 deaths, or a maternal mortality of 25.79 per cent. During the first period, that is, up to 1908, there were 198 cases with 95 deaths, or a mortality of 47.97 per cent. There were 29 cases of the 500 where the year of the operation was not given; therefore, so as to be absolutely accurate, these cases were omitted in making up the mortality figures. For the sake of completeness and comparison and for no other reason it may be well to state that in the 500 cases there were 174 deaths, or a total mortality of 34.8 per cent.

Inasmuch as the value of the statistics in this paper depends upon the arrangement of the cases into groups from the standpoint of the date at which the operations were performed, further explanation in favor of the plan adopted may be necessary. Total mortalities obtained by collecting cases where operations were performed either before the advent of asepsis or where the latter was imperfectly carried out are of little value for us today. If we wished to obtain an accurate idea of the mortality of the removal of fibroids of the uterus by hysterectomy, either supravaginal or complete, we would not think of collecting operations from the literature performed during the time gynecologists were trying out different forms of operative technique. Statistics based upon such cases would be quite valueless, so far as our present-day viewpoint is concerned. Of what value would be a statistical study of the mortality incident to the operation for appendicitis based upon a series of operations some of them performed in the days when we operated only as a last resort, or waited until an abscess had formed about the appendix?

It is absolutely necessary to study the results of opera-

tions by the group method, if great changes in operative technique have arisen during the period the cases in the entire series have occurred. Yet this seems to have been lost sight of in the statistical study of abdominal Cesarean section for eclampsia.

Routh has recognized the necessity of grouping chronologically cases of abdominal Cesarean section performed for different obstetric conditions. He collected 1282 cases of this operation performed by obstetricians and gynecologists of the United Kingdom who were living June 1, 1910. He was able to collect in all 1058 cases of abdominal Cesarean section for contracted pelvis with a mortality of 9.7 per cent. Up to 1891 there were 26 cases with a mortality of 30.7 per cent., while from 1906 to 1910 (uncompleted five years) there were 602 cases with a mortality of 6.1 per cent. Thus if the cases had not been grouped, the mortality for abdominal Cesarean section for contracted pelvis would have stood at 9.7 per cent., while with present-day methods it is 3.5 per cent. lower. It also follows the greater the number of cases in the earlier periods, the higher the total resultant mortality will be, hence the greater the error.

So far as I have been able to observe all mortality statistics of abdominal Cesarean section for eclampsia have almost without exception been made without regard to when the operations were performed, hence are valueless so far as furnishing us with a correct valuation of the operation, as it stands today, is concerned. Routh is no exception to the rule, for while recognizing the necessity for the grouping system as regards his own statistics, he quotes Kettlitz as having collected 28 cases with 14 deaths, Hillman 40 cases with 21 deaths, Streckeisen 26 cases with 8 deaths. The total mortality of the operation in eclampsia in 105 cases was 47.6 per cent. By his own reasoning this mortality must be too high; how much too high could only be ascertained by grouping the cases he quotes.

"Moran collected 116 cases of abdominal Cesarean section from the literature with a maternal mortality of 48.9 per cent. He tries to rectify this unquestionably excessive mortality by grouping 53 cases occurring from 1901 to 1911 with a maternal mortality of 32.32 per cent. But he failed to realize what I have already pointed out, that obstetric surgery and especially abdominal Cesarean section have not advanced as rapidly as have other departments of surgery. Only within the past five years has it begun to dawn upon the mind of the obstetric surgeon in general that we cannot remove the child by the suprapubic route without a high maternal mortality if attempts have been made to deliver from below or even if many vaginal examinations have been made."

I have been rather insistent upon explaining the necessity of the group method of making up mortality statistics since totally erroneous figures are quoted by those who oppose the operative treatment of antepartum eclampsia. Zinke, for instance, quotes Moran's 32.32 per cent. mortality and says "if this is advancement, the writer fails to see it." The same writer quotes Routh as reporting seven cases of Cesarean section for eclampsia with four deaths, or a mortality of 57 per cent., and then adds "Think of it." The great trouble is the lack of thinking going on all the time in regard to mortality statistics. Zinke might just as well have picked out a single case report where death followed the operation and asked us to think of a 100 per cent. mortality. What has the mortality resulting from seven cases to do with any question? When will we learn that statistics made up from less than one hundred cases of any condition must be quoted with reservations?

Dr. Zinke is impressed with the importance of the results of his last thirty cases of eclampsia treated medicinally with a maternal mortality of 13.3 per cent. Such results are to be commended because so many mothers out of the thirty

lived, but the series is rather small to be of great importance in determining the value of any kind of treatment. His next thirty cases may show very different results. A small number of cases can be used to prove almost anything. By using this method Zinke's claim to the superiority of medicinal over operative treatment of eclampsia could be overthrown at once by statistics furnished by one operator in my own series (Table I), who had 14 abdominal Cesarean sections for eclampsia with one death, or a maternal mortality of 7.14 per cent.

TABLE I.—List of Operators Who Have Had Five or More Cases of Abdominal Cesarean Section for Eclampsia From 1908 to 1913.

Operators.	Cases.	Recoveries.	Deaths.	Mortality, per cent.
Brown, D. J.	10	8	2	20.00
Burns, T. M.	7	7	0	.....
Davis, A. B.	9	5	4	44.44
Henkel, M.	5	2	3	60.00
Ill, C. L.	9	9	0	....
Ill, E. J.	5	5	0	....
Johnston, W.	5	4	1	20.00
MacLean, H. S.	5	5	0	....
Markoe, J. W.	6	3	3	50.00
Michailoff, N.	5	5	0	....
Mullally, L.	6	4	2	33.33
Nason, F. T.	14	13	1	7.14
Williams, E. M.	5	4	1	20.00
	91	74	17	18.68

Still one would hardly claim this to be the average mortality of eclampsia treated by abdominal Cesarean section.

In a previous article certain figures were given of the results of the five operators sending in the largest number of cases (9.5 per cent. mortality in forty-two cases) and the mortality of 120 cases furnished by twenty operators having five cases or more. Since these figures were published it has been found that some of these twenty operators had been credited with cases in reality performed by others, but

reported by them in correspondence. The corrected list in Table I, is given and shows that during the period from 1908 to 1913 thirteen men performed five or more abdominal Cesarean sections for eclampsia. In all there were ninety-one cases with seventeen deaths, or a maternal mortality of 18.68 per cent. This is a remarkable showing for a series numbering one-fifth of the entire series of 500 cases.

A study of Table I also shows that the mortality records of the different operators vary from no mortality at all up to 60 per cent., always keeping it clearly in mind that the percentages are made up from a small number of cases. I have no means of knowing the condition of Henkel's and Mullally's patients before operation, but Davis has explained the reason for the high mortality in his and Markoe's cases at the New York Lying-in Hospital by saying that their material was made up of many moribund and septic patients. As I shall show latter abdominal Cesarean section for eclampsia is contra-indicated under these conditions. Deducting the fifteen cases of these two operators we have seventy-six cases with ten deaths, or a maternal mortality of 12.15 per cent., by a curious coincidence a fraction of a per cent. less than that quoted by Zinke for his thirty cases treated medicinally.

I am fully aware of the danger of drawing conclusions from such a small number of cases, although the number is over twice as large as that quoted by Zinke. I am also aware that there is danger in excluding cases for apparently good and sufficient reasons; hence I have been careful to explain just how and why such exclusions were made and have refrained from drawing conclusions. Still the series in whole or in part is interesting as showing the results of abdominal Cesarean section for eclampsia in the hands of men who have had experience with the operation under consideration.

While 25.79 per cent. cannot be considered a low maternal

mortality for the treatment of eclampsia, it is surprisingly low for abdominal Cesarean section in this complication of pregnancy. Any operation carrying with it a 40 or 50 per cent. mortality would only be persisted in because of urgent necessity, never as a matter of choice. If, however, the figures stand at 25 per cent. with every prospect of being still further reduced if certain features making for a high mortality can be eliminated, abdominal Cesarean section at least must be given a respectful hearing as a treatment of certain cases of eclampsia provided operative treatment is to be employed.

Later, certain facts will be brought forward explanatory of the high mortality (25.79 per cent.) attendant upon this operation, that is, high as compared with other methods of treatment. Now I merely wish to emphasize the fact that the old mortality figures of this operation for eclampsia are incorrect.

In another article I have proved the advantages of operative delivery in eclampsia over medicinal treatment and spontaneous labor. In 200 cases of eclampsia occurring between 1900 and 1912, where the patients were delivered spontaneously the maternal mortality was 18.96 per cent., while in 1496 cases treated by operative delivery during the same period the maternal mortality was only 14.8 per cent., an advantage of 4 per cent. in favor of operative delivery.

Just as in the vaginal Cesarean series, undoubtedly the present abdominal Cesarean series contained a very large proportion of desperate cases, otherwise such a serious and rather unusual operative procedure for this condition would not have been undertaken. For this reason many patients were operated upon who were doomed no matter what treatment was instituted. I am confirmed in this belief by the good results obtained by the few men who were inclined to broaden the indications for the operation, emptying the uterus by this method whenever the woman was having con-

vulsions. I am not saying that this is a justifiable treatment for antepartum eclampsia. I am simply stating why possibly one-quarter of the women died after the operations, namely, that the operations were performed in many instances upon desperately sick women so profoundly affected by the eclamptic toxin that death resulted in spite of treatment.

The relation between emptying the uterus and the cessation or continuation of convulsions.

Let it be clearly understood that the condition of the eclamptic can only be judged in a general way by the number and severity of the convulsions. It is fully realized that an eclamptic can die after a single or survive after many convulsions. Again there may be a true eclampsia without a convulsive seizure. Yet in spite of these exceptions to the rule we have in the convulsions a fairly good index of the degree of intoxication present. By virtue of the fact that the pregnant woman has had a convulsion, we judge her condition to be one of eclampsia and her case entitled to consideration in a series of eclamptic cases. The more violent the convulsions, the more frequent their recurrence, and the more the patient is subjected to, other things being equal, the greater the eclamptic intoxication and the more serious the condition of the patient. Hence until some better method of estimating the condition of the eclampsia be shown we are forced to lay great stress upon the convulsions as an index of the extent of the eclamptic poisoning.

In the vaginal Cesarean series 2135 cases of eclampsia were analyzed in regard to the cessation of convulsions after delivery. These cases included patients with spontaneous and operative delivery and showed that convulsions ceased after the uterus was emptied in 52.7 per cent of the cases. A study of 247 cases where delivery was spontaneous showed cessation of convulsions in 59.5 per cent., while in 994 cases after operative delivery the convulsions ceased

in practically the same percentage of cases (59.4). In 453 cases of vaginal Cesarean section for eclampsia the convulsions ceased in 62.6 per cent. of the cases. From this it was concluded that it made very little difference as regards the cessation of convulsions whether the delivery ended spontaneously or was terminated by operative means.

In the present series of cases of abdominal Cesarean section for eclampsia there were 457 cases where data regarding the continuation or cessation of convulsions after the operation were available. In 251 of these 457 cases or in 54.92 per cent. the convulsions ceased after the uterus was emptied, these figures corresponding to the other figures quoted, 52 to 62 per cent., of cessation of convulsions after the uterus is emptied either spontaneously or by artificial means.

Apparently there is still considerable confusion regarding the entire question of the cessation or continuation of convulsions after the uterus of the eclamptic is emptied. The subject is rather a complex one and not so easily settled as might at the first glance be supposed. As has been stated, the convulsions in a general way indicate the amount of the eclamptic poisoning present in a given case, with the exceptions noted. Emptying the uterus and thereby removing the condition giving rise to the toxemia of pregnancy would surely put a stop to this toxemia if performed at the very beginning of the elaboration of the poisons. No one would question the truth of this statement. However, if the toxemia continues up to the point where the maternal organism reacts in the form of an eclamptic convulsion, emptying of the uterus, either spontaneously or by artificial means, while it puts a stop to further elaboration of toxins from the fetus or placenta or both, may not be sufficient to prevent further convulsions, or in certain cases death of the mother from an intoxication which was present prior to the delivery. In other words, the patient either has one or more convulsions after delivery and recovers or dies from the eclamptic

intoxication in spite of the relief afforded by emptying the uterus.

As a matter of fact too much stress must not be laid upon the cessation or continuation of convulsions after any form of treatment of eclampsia. For the reasons stated above the convulsions will cease only in a little over one-half the cases no matter what form of treatment be employed. Lichtenstein who claims very favorable results in a small number of cases of eclampsia where venesection was employed thinks the cessation of the convulsions in 59 per cent. of the cases to be due to the treatment employed. If this claim be valid how does he explain the cessation of the convulsions in the vaginal Cesarean series in 62.6 per cent. of the cases after delivery by operative means? In order to answer the question why the convulsions did or did not cease in the two series of cases we would have to be in a position to state the degree of intoxication in each individual eclamptic, a question, so far as the convulsions are concerned, either before or after delivery, we are in no position to answer by present-day methods.

The Relation Between the Cessation of Convulsions and the Maternal Mortality. Another proof that the cessation or continuation of the convulsions after delivery is only of relative importance in judging of the condition of the eclamptic is seen in the mortality figures in the two classes of cases. If it were the whole story we would judge that the victory had been won if the convulsions ceased, but we know this to be untrue.

The maternal mortality in 251 cases in the present series where the convulsions ceased after delivery was 27.8 per cent. against a total mortality in the whole series of 34.8 per cent. By the grouping system we find that up to 1908 in 105 cases where the convulsions ceased there were 41 deaths or a mortality of 39.04 per cent., while in 146 cases occurring between 1908 and 1913 there were 29 deaths, or a maternal

mortality of 19.8 per cent, as against a total mortality during this period of 25.79 per cent.

If the cases where the convulsions continued after delivery be considered it will be found that up to 1908 in 76 cases there were 38 deaths, or a mortality of 50 per cent.; while in 130 cases between 1908 and 1913 there were 41 deaths, or a maternal mortality of 31.53 per cent.

Seitz's cases together with the cases of my two series have been arranged in a table as follows:

TABLE II.—Maternal Mortality in Relation to the Cessation or Continuation of the Eclamptic Convulsions

	Cessation of convulsions.			Continuation of convulsions,		
	No. of cases.	Deaths.	Mortality, per cent.	No. of cases.	Deaths.	Mortality. per cent.
Seitz	123	25	20.3	102	22	21.5
Peterson (vaginal Cesarean). . . .	284	50	17.6	169	54	31.9
Peterson (abdominal Cesarean) 1908–1913	146	29	19.8	130	41	31.5
Total	553	104	18.8	401	117	28.1

Thus it may be seen that the analysis of the cases of the present series gives weight to the conclusion set forth in the first paper that the fact that convulsions cease after delivery does not mean that the patient will recover, since under these circumstances about 20 per cent. die; however, it may be said that when the convulsions cease the patient stands a much better chance of recovery since the mortality is 10 per cent. higher when the convulsions continue after the uterus is emptied.

The Variations in Maternal Mortality Dependent Upon when the Uterus is Emptied in Relation to the Convulsions. In my opinion no form of operative treatment of eclampsia has been given a fair trial. If our reasoning has been correct, emptying the uterus will prove advantageous, provided the treatment be instituted early, before the maternal

and fetal organisms are overwhelmed by the eclamptic poison. If the operative treatment be delayed through injudicious attempts to cure the patient by medicinal means while the toxins are being elaborated by virtue of the continuation of the pregnancy, the results of such treatment must necessarily be rendered poor in proportion to the amount of the delay. Until this is clearly appreciated the best results will not be obtained from operative treatment. The position of those who advocate the medicinal treatment of eclampsia is absolutely untenable. They are simply repeating for the treatment of eclampsia arguments long since shown absolutely incorrect as regards other forms of treatment. For example, one has only to recall the history of the treatment of ectopic pregnancy to be convinced of the truth of this statement. In the early days of the treatment of this condition all kinds of therapy were suggested, electricity and injection of the gestation sac with various poisonous substances in order to kill the fetus; in fact anything and everything to avoid the only rational treatment, the removal of the ectopic sac by operation. In this condition, temporizing and trying all kinds of treatment except the right one costs many lives. Once the surgical treatment was established upon a proper basis, the mortality was reduced to below 5 per cent., even including desperate cases.

The advice of those who urge the medicinal treatment of eclampsia while the woman is undelivered is irrational as a working rule. Certainly it does not give the operative treatment of eclampsia a fair show, for its advocates say, "use every means except surgical in antepartum eclampsia and then if the fight is going against you empty the uterus." There can be only one result of such delayed operation, a high maternal and fetal mortality.

While the number of antepartum convulsions may not be an exact index of the patient's condition, in a general way they do furnish this information. The chances of an eclamp-

tic with one convulsion are infinitely better than are those of the patient who has had twenty-five. But it is a mistake to endeavor to compile statistics from what follows a certain number of convulsions. Especially is this true if we are dealing with a small number of cases. For instance, it was a mistake in my former article to give the mortality percentages separately after from one to ten convulsions. Immediately the eye took in the fact that the table showed that the maternal mortality where the operations were performed after the first convuslion was 18.51 per cent. while in fourteen cases where the operations were performed after the ninth convulsion the mortality was only 7.14 per cent. Although this was explained in the text, the explanation counted for little.

The convulsions in relation to the maternal mortality have been considered in two large groups, first, all the cases between 1908 and 1913 arranged according to whether the operations were performed after from one to five convulsions or after from six or more convulsions. The second group has been worked out in a similar manner as regards the time after the convulsions the operations were performed, but has also been arranged according to whether the convulsions ceased or continued after the operations.

(*a*) There were 213 cases in the first group. Of these there were 124 operations after from one to five convulsions with twenty-five deaths, or a maternal mortality of 20.32 per cent. This is an exceedingly low mortality from an operative procedure which has been thought to carry with it a death rate of nearly 50 per cent. It will be noticed that the mortality is 5 per cent. lower where the operations have been performed after a few convulsions than where there has been delay in emptying the uterus.

If to this immediate emptying of the uterus or at least its emptying shortly after the onset of the convulsions be added non-contamination of the puerperal tract from below by the

avoidance of or limitation of vaginal examinations or attempts at delivery, a maternal mortality is found which more nearly represents what should be accomplished by the suprapubic route. For out of the 124 operations there were sixty where no or only one or two vaginal examinations were made and where no attempts were made to deliver from below. There were only nine deaths after these sixty operations, or a maternal mortality of 15 per cent. Granting this to be a small number of cases, as far as they go they indicate that in clean cases with clean surgery, performed after a few convulsions the maternal mortality compares very favorably with other forms of eclamptic treatment. Also it holds out a hope that under equally favorable circumstances the same or even better results can be obtained in a larger number of cases.

I have no argument with those who attempt to explain such figures by saying that a large proportion of such operations were probably useless and that many of the patients would have recovered without them. Such statements are as worthy of notice as would be the suggestion that probably the drugs used in the medicinal treatment of eclampsia were inert and therefore might just as well not have been administered. The point is that the patients were eclamptics as shown by the convulsions and other symptoms and that they recovered after the uterus was emptied by the suprapubic route. This does not mean that every woman with eclampsia should be subjected to the same treatment or that equally good results may not be obtained by other methods. That is another question altogether and must be considered separately. But nothing is gained by trying to explain a mortality by suggestions which do not explain and besides are foolish in the extreme.

The increase in mortality due to delay is shown by the fact that in eighty-nine eclamptics where the operations were performed after the sixth convulsion there were

twenty-seven deaths, or a mortality of 30.33 per cent. This is 10 per cent. higher than after quick delivery and 5 per cent. higher than the total mortality during this same period.

(*b*) Where there is a cessation of convulsions after the uterus has been emptied the presumption is that the patient is in better condition than where the convulsions continue, although, as we have seen, death occurs in a certain percentage of these cases. But these deaths may have occurred from delay in operating even if no convulsions follow. This is shown by the fact that in sixty cases where there was a cessation of the convulsions after the operations where the latter were performed after from one to five convulsions, there were eight deaths, or a maternal mortality of 13.33 per cent. In fifty-two cases under the same conditions, except that the convulsions continued, there were fourteen death or a mortality of 26.92 per cent. We are forced to the conclusion, then, that this double as high mortality was due to the fact that even with immediate operation after the onset of the convulsions the patients were so toxic that death followed in spite of operative treatment.

Where the abdominal Cesarean sections were performed after more than five convulsions in thirty-eight cases there were ten deaths, or a mortality of 26.31 per cent. where there were no convulsions after the operations. In forty-four cases under the same conditions, except that the convulsions continued, there were sixteen deaths, or a mortality of 36.36 per cent.

Miscellaneous Statistics Relating to the Convulsions. For the sake of completeness and for comparison with the data submitted in the vaginal Cesarean paper certain statistics have been arranged in the following tables. Only those cases could be used where definite statements were made regarding the convulsions before and after the abdominal sections.

TABLE III.—Average Number of Convulsions in Antepartum Eclampsia under Different Conditions with Abominal Cesarean Section

	Number of cases.	Average number of convulsions.	Average number of convulsions before operation.	Average number of convulsions after operation.
Patients where number of convulsions was given	386	9.0	7.0	2.0
Patients recovered. .	258	8.0	6.1	2.0
Patients died . . .	128	11.4	7.7	3.9
Primiparæ	322	9.3	6.9	2.7
Multiparæ	59	7.9	5.7	2.2
Twin pregnancies . .	17	7.3	6.3	1.2

In Table III the cases have been grouped irrespective of the period in which the operations were performed. As would be expected, the average number of convulsions was much less where the patients recovered. Lichtenstein emphasizes the fact that by the venesection treatment of eclampsia the average number of convulsions has been reduced from an average of 13.5 per patient as given by Glockner in 400 cases to 5.1 per patient in his 39 cases. Seitz's average number was 8 while Büttner's was 10. The average number per patient in the vaginal Cesarean series was 8, while in the present series in 386 cases the average was 9 per patient.

Too much importance should not be placed upon the increase or decrease in the number of convulsions per patient in a given series of cases where a certain line of treatment has been pursued. A great many factors, like delayed treatment, medicinal or operative, the kind of treatment employed after delivery, etc., tend to make the subject very complex and to warn us not to place too much importance upon the average number of convulsions.

The cases have been grouped according to periods in Table IV for the purpose of comparison. It will be seen that on the whole the figures in the cases occurring during 1908 to 1913 are decidedly lower than in the cases occurring

before 1908. This is what could be expected and undoubtedly is due to prompter delivery and better operative technique.

TABLE IV.—Average Number of Convulsions in Antepartum Eclampsia Under Different Conditions Up to 1908, and from 1908 to 1913.

	Up to 1908.				1908–1913.			
	No. of cases.	Average No. of convulsions.	Average No. of convulsions before operation.	Average No. of convulsions after operation.	No. of cases.	Average No. of convulsions.	Average No. of convulsions before operation.	Average No. of convulsions after operation.
Patients where number of convulsions was given . . .	138	10.0	8.0	2.0	242	8.0	5.0	3.0
Patients recovered	76	9.2	8.0	1.6	182	7.2	5.3	2.0
Patients died . .	62	11.0	8.6	2.7	59	1.7	7.1	4.8
Primiparæ . . .	115	10.5	8.6	2.3	192	18.6	5.9	2.9
Multiparæ . . .	18	9.0	7.0	2.4	40	7.0	5.2	2.2
Twin pregnancies	7	10.1	7.9	2.1	9	5.2	4.5	0.8

TABLE V.—Frequency of Multiple Pregnancy in Eclampsia.

	No. of cases.	Twins.	Per cent.	Triplets	Per cent.
Esch	49¼	19	0.8		
Glockner	147	9	6.1	1	
Goedecke	403	19	4.7	1	
Goldberg	81	4	4.9		
Olshausen	200	16	8.0		
Peterson (vaginal Cesarean)	530	17	3.2		
Peterson (abdominal Cesarean,	500	21	4.02		
Schauta	342	27	7.8		
Zweifel	83	5	6.0	1	
	2782	137	4.9	3	0.13

Table V has been made up from Table XI of the vaginal Cesarean article by the addition of the number of twin pregnancies in the present abdominal Cesarean series. It will

be seen that twins occurred twenty-one times in the 500 cases, or in 4.02 per cent. This was more frequent than in the 530 cases of vaginal Cesarean section, although not quite as frequent as in the 2782 cases of eclampsia (4.9 per cent.). This is the proportion of a twin pregnancy to about every twenty-four cases of eclampsia, relatively over three times as frequent as are twins in normal cases.

The Fetal Mortality after Abdominal Cesarean Section for Eclampsia. It is to be expected that the fetal mortality from the treatment of eclampsia by abdominal Cesarean section would be less than from any other operative procedure. By this method the child is lifted from the uterus, thereby escaping all trauma resulting from spontaneous or operative delivery through the natural passages. Were it not for the fact that the fetus receives but little consideration in the treatment of this grave complication of pregnancy, there would be more of a place for the abdominal operation on the ground that it gives the fetus the best chance for life. But in practice the child is still apt to be disregarded and all efforts bent on saving the mother. While there are good scientific grounds for this attitude on the part of the obstetrician, for even if the child be saved primarily there are many chances of its dying later, there is no gainsaying the fact that if the results of abdominal Cesarean section for eclampsia were to be shown equal to other good methods of treatment, its superiority, so far as the fetal mortality is concerned, would make it the operative treatment of choice.

I cannot do better than to quote from my former article the reasons for the method adopted in the two series of cases for estimating the value of the operative treatment so far as the fetus is concerned.

"Obviously, it is unfair in the estimation of the value for the fetus of any form of treatment in eclampsia to include cases where the period of gestation is so early as to preclude any hope that the child may live after artificial or spontane-

ous delivery. Hence certain exclusions must be made. Just what these shall be is necessarily somewhat arbitrary, but if stated as a preliminary to the statistics, the results give an approximately correct idea of the fetal mortality. In estimating the fetal mortality the following rules were observed.

1. All children weighing less than 2000 grams up to the eighth month were judged to be premature and were not counted whether they lived or died.

2. No child was included, who was known to be dead at the time of the operation.

3. If a child lived an hour or more after delivery it was counted as living, if less than an hour it was included among the deaths."

It may be said regarding these rules that a child might live an hour and then die, either within a few hours or a few weeks, hence an hour is too short a time to select. A little consideration will show that very little weight should be given to this criticism, since the child is liable to perish at any time during the first few hours, weeks or months of its life. The criticism would apply equally well if twenty-four hours or a week or four weeks were chosen. At the expiration of an hour after its birth it has been decided definitely whether a child is to live or whether it is to be stillborn. So this might just as well be selected as a criterion as a subsequent hour or day.

However, in all fairness it must be stated that all fetal mortality statistics have not been made upon this basis, hence this fact must be taken into consideration in comparing the different results. A great deal of confusion would be saved if some sort of standard could be adopted, or at least if each author would state under what conditions he judged a child to have lived or died after the delivery.

As an aid to the comparison of the present fetal statistics with those made under different standards, certain statistic

have been worked out in Table VI in which all children dying within the first three days after the deliveries have been counted among the deaths. Other cases beside the eclampsia or the operation may have caused these deaths but they are given for the reason stated and may be taken for what they are worth.

From 1908 to 1913 there were 248 children delivered by abdominal Cesarean section with 9 deaths, or a fetal mortality of 3.62 per cent. Up to 1908 there were 133 cases with 16 deaths, or a fetal mortality of 12.03 per cent. Thus it will be seen that the fetal mortality in the first period was almost four times as great as that during the five-year period, from 1908 to 1913.

TABLE VI.—Fetal Mortality in Eclampsia Under Various Methods

	No. of children.	Deaths.	Mortality. per cent.
Various Methods	1478	460	31.1
Vaginal Cesarean section (living one hour)	315	67	21.1
Abdominal Cesarean section (up to 1908; living one hour)	133	16	12.03
Abdominal Cesarean section (up to 1908; counting children dead who died first few days after delivery)	130	32	24.61
Abdominal Cesarean section (1908–1913; living one hour)	248	9	3.62
Abdominal Cesarean section (1908–1913; counting children dead who died first few days after delivery)	243	26	10.69
Abdominal Cesarean section (up to 1908; after 1–5 convulsions)	40	3	7.50
Abdominal Cesarean section (1908–1913; after 1–5 convulsions)	118	3	2.54
Abdominal Cesarean section (up to 1908; after 6 or more convulsions)	49	13	26.53
Abdominal Cesarean section (1908–1913; after 6 or more convulsions)	76	6	7.89

Various interesting facts besides those statistics above regarding the fetal mortality after abdominal Cesarean section for eclampsia have been arranged in Table VI. Just as

the maternal mortality was lowest when the uterus was emptied early after the first convulsion, so the lowest fetal mortality (2.54 per cent.) occurred in the period from 1908 to 1913 where the operations were performed after from one to five convulsions, that is, under good technique and before the child as well as the mother was overwhelmed by the eclamptic toxin. Faulty technique probably accounted for double this mortality up to 1908 for in both groups of cases the operations were performed equally early.

The highest fetal mortality (26.52 per cent.) was found in 40 cases where the operations were performed before 1908, and after six or more convulsions. Even in the five-year period the fetal mortality is high (7.89 per cent.) compared with the 2.54 per cent. mortality obtained through prompt operating and good technique.

Zinke in 30 cases of eclampsia reports a fetal mortality of 50 per cent. Lichtenstein after certain exclusions had a fetal mortality of 25 per cent. in 50 children born after the venesection and narcotic treatment. After various methods of delivery with some exclusions in 1487 cases there were 460 children died, or a fetal mortality of 31.1 per cent. After vaginal Cesarean section the fetal mortality was 21.2 per cent. In the light of such figures the obstetrician is bound to consider the rights of the fetus when by a certain operation the fetal mortality can be reduced to 2.54 per cent. with a maternal mortality in 60 cases of 15 per cent.

The Relation between Primi- and Multigravity and Eclampsia. Out of 500 cases of abdominal Cesarean section there were 474 cases where it was definitely stated whether the woman was a primipara or multipara. Of these 397, or 83.75 per cent., were primiparæ; while 77, or 16.17 per cent., were multiparæ. This is a larger proportion of primiparæ than was the case in the vaginal Cesarean section series where 73.1 per cent. of 517 eclamptics were primiparæ. In 3134 cases of eclampsia collected in reference to this point (see

Table VII) it was found that 75 per cent. of the eclamptics were primiparæ. Probably the greater proportion of primiparæ in the present series was due to the fact that primiparous conditions such as undilated and rigid cervix and rigidity of the soft parts more often call for the abdominal operation than for other methods of delivery.

It was found in the former investigation that the maternal mortality was higher among the multiparæ than with the primiparæ. In the 3134 collected cases it was 28.4 per cent. in the 771 multiparæ, while it was 22.35 per cent., or lower by 6 per cent. among the primiparæ.

TABLE VII.—Primiparæ and Multiparæ in Eclampsia
(Table XV in Vaginal Cesarean Article.)

Author.	Total number of cases.	Primiparæ,				Multiparæ.			
		No. of cases.	Per cent. of cases.	No. of deaths.	Per cent. of mortality.	No. of cases.	Per cent. of cases.	No. of Deaths.	Per cent. of mortality.
Büttner . .	507	350	69.0	77	22.0	157	31.0	52	33.0
Esch . . .	496	385	78.3	82	21.3	107	21.7	24	22.4
Glockner . .	147	116	80.0	23	19.8	29	20.0	3	10.3
Goedecke .	403	304	75.4	47	15.5	99	24.6	21	21.2
Goldberg . .	81	70	86.4	15	21.4	11	13.5	5	45.4
Hammerschlag	291	198	68.0	45	23.0	93	32.0	30	32.0
Löhlein . .	103	88	85.4	18	20.5	15	14.6	5	33.3
Olshausen .	200	145	75.0	34	23.7	51	26.0	17	33.3
Peterson . .	517	378	73.11	81	21.4	139	26.8	37	26.7
Schauta . .	306	353	82.6	93	37.3	53	17.4	24	44.8
Zweifel . .	83	66	79.5	11	16.6	17	20.4	1	5.5
Total . .	3134	2353	75.08	526	22.35	771	24.6	219	28.4

In the present series in 225 primiparæ where the abdominal Cesarean sections were performed from 1908 to 1913 the maternal mortality was 24.44 per cent. while in 48 multiparæ during the same period the mortality was 27.08 per cent.

The fetal mortality was also higher during the same period among the children of multiparous mothers. In 203 children of primiparæ the fetal mortality was 3.44 per cent., while in 44 children from multiparous mothers the fetal mortality was 4.54 per cent.

I have no reason for changing the conclusions arrived at from a study of this part of the subject in the former article. In fact these conclusions are strengthened by the above figures, since the children of both primiparæ and multiparæ because they were removed by the abdominal route escaped the traumatisms of labor. Hence the high fetal mortality in the children of multiparæ must be due to the greater intoxication in the multiparous as compared with the primiparous mothers.

Also we see no reason for changing our conclusions that the higher mortalities, both maternal and fetal, among the multiparæ may be ascribed to the ages of the latter. Naturally they are older than the primiparæ and once the victims of eclampsia, less able to withstand its resulting poisoning. For the sake of completeness it may be stated that the average age of the 397 primiparæ was 24.6 years, while that of the 77 multiparæ was 32.6 years.

The Relation between Age and the Eclampsia. In a general way while the mortality percentages bear out the above statements regarding the influence of the age of the eclamptics upon the degree of intoxication present, there was not as much regularity as shown in the vaginal Cesarean section series. During the five-year period there were 55 eclamptic patients between the ages of 16 and 20. The maternal mortality was 23.63 per cent. Between the ages of 31 and 35 there were 45 patients with 14 deaths, or a mortality of 31.11 per cent.; while in 14 cases where the patient's ages ranged from 41 to 46 there were 6 deaths, or a mortality of 42.85 per cent.

The age of the youngest patient was 12 and that of the oldest 46. The average age of 448 patients was 26.6.

The Period of Gestation in its Relation to Eclampsia. The period of gestation was given in 465 out of 500 cases. These cases are arranged in Table VIII so as to show the percentage of cases at the different periods of gestation.

TABLE VIII.—Cases of Eclampsia Arranged According to Periods of Gestation.

Period of gestation.	No. of cases.	Per cent. of cases.
Fifth month	1	0.21
Sixth month	5	1.07
Seventh month	40	8.60
Eighth month	86	18.49
Ninth month (full term)	333	71.61

Naturally the largest number of cases occurred at the ninth month, or full term, because abdominal Cesarean section was more often indicated at that period of gestation as the easiest and quickest method of delivering the patient. However, this is not the only reason for the prevalence of eclampsia in the later months of pregnancy, since Glockner, Goedecke and others have shown that it is much more common in patients at the eighth or ninth months of gestation. More than one-half (56.3 per cent.) of the vaginal Cesarean sections were performed at full term. Just as in that series there was no case of eclampsia prior to the fifth month in the present series and the number of cases increased from that period up to full term.

TABLE IX.—Periods of Gestation and Maternal Mortality in Eclampsia (1908–1913)

Period of gestation.	No. of cases.	Deaths.	Mortality, per cent.
After thirty-second week	192	44	22.91
Twenty-fifth to thirty-second week	77	22	28.57
Below twenty-fifth week	5	3	60.00

In Table IX the cases have been arranged according periods of gestation and maternal mortality. Just as in the vaginal Cesarean series it is found that the further advanced the pregnancy the lower the maternal mortality. While the number of cases below the twenty-fifth week is too small to be of much value from a statistical stand-point, the number of cases at the other periods of gestation is large enough to draw conclusions from.

TABLE X.—Operative Procedures Prior to Abdominal Cesarean Section

	No. of cases.
Attempted vaginal Cesarean section	4
Bougie	3
Colpeurysis	1
Dilatation	11
Dilatation and bougie	1
Dilatation with bags	4
Dilatation with metal dilators and with fingers	1
Dührssen incisions	1
Forceps	7
Forceps and version	1
Hegar's dilator and colpeurynter	1
Manual dilatation	11
Manual dilatation and forceps	2
Manual dilatation and puncture of membranes	1
Metreurynter	1
Tamponade of cervix	1
Version and perforation	2
Total	53

Operative Procedures Prior to Abdominal Cesarean Section. The operations performed prior to the vaginal Cesarean sections were listed and the 5 per cent. higher mortality in the patients upon whom these operations were performed attributed to the delay with its increased maternal and fetal intoxication. Quite a few of the deaths could have been caused by sepsis which not infrequently arises from prolonged and unsuccessful attempts at delivery from below.

But as already pointed out the danger from sepsis is much less than in abdominal section after prior operative procedures, since in the vaginal operation the peritoneal cavity is opened only accidentally. In fact so great is the increased risk of a fatal result following abdominal Cesarean section for any condition where prior attempts have been made to deliver from below, that it is questionable whether the abdominal operation is ever justifiable under these circumstances. Certainly it is contra-indicated unless the operator can be absolutely sure of the technique previously employed. Otherwise craniotomy would be a far preferable procedure. The true situation is probably not fully grasped by operators in general else we would not be confronted with the list of operative procedures (see page 135) attempted prior to the abdominal Cesarean sections.

In twenty-nine cases where various operative procedures were undertaken from below from 1908–1913 there were 10 deaths, or a maternal mortality of 34.48 per cent. This high death rate as compared with the total death rate (25.79) during the same period was due principally to sepsis although shock and delay may have contributed their share to the results.

Vaginal Examinations Prior to the Abdominal Cesarean Sections and the Maternal Mortality. It is exceedingly difficult to obtain from published cases or from a questionnaire accurate information regarding possible contamination of the genital tract through vaginal examinations. Routh's analysis of abdominal Cesarean section cases has shown the danger of frequent examinations or attempts at delivery since the maternal mortality under these conditions is 34.3 per cent. in comparison with 2.9 per cent. where the operations have been performed when the patients were not in labor and the membranes unruptured. But it is too much to expect that any great proportion of eclamptics will be subjected to abdominal Cesarean section without first being

subjected to thorough pelvic examination, nor would this be desirable. In the great majority of cases eclampsia comes suddenly without warning and without previous knowledge of the size of the bony pelvis of the soft parts. Hence at least one vaginal examination is almost always necessary.

Again, it is impossible to ascertain from a questionnaire the manner in which the vaginal examinations were made. It is perfectly possible to make a number of such examinations in accordance with an aseptic technique so perfect as to be almost without danger. On the other hand it is equally possible to infect the woman through a careless technique by one vaginal exploration.

In 188 cases during the five-year period it was recorded that one or more vaginal examinations were made. There were fifty-five deaths among these patients, or a maternal mortality of 29.25 per cent. distinctly higher than the total maternal mortality (25.79 per cent.) during this period. Again combining the few cases where it was distinctly stated that no vaginal examinations were made with those cases where no statement was made, ninety-five cases in all, we find there were eighteen deaths, or a maternal mortality of 18.94 per cent.

As far as this evidence goes we are justified then in concluding that a certain proportion of the deaths during the five-year period were due to prolonged or badly conducted vaginal examinations with the understanding that such examinations would have been productive of far less mortality had not the peritoneal cavity and the uterus been opened subsequently.

Indications for the Abdominal Cesarean Sections for Eclampsia. In sixty-eight of the 500 cases no statement was made as to why the abdominal Cesarean sections were performed. The indications for the remaining 432 operations have been listed in Table XI.

TABLE XI.—Indications for Abdominal Cesarean Section in 500 Cases of Eclampsia

Indications.		No. of cases.
Eclampsia		116
Undilated cervix	89	
+ narrow vagina	9	
+ obesity	6	
+ edema of soft parts	3	
+ weak heart	2	
+ previous ventrofixation	1	
+ obesity and edema of vulva	1	
	111	111
Contracted pelvis	78	
+ narrow soft parts	3	
+ large child	3	
+ prolapsed cord	1	
+ tetanus uteri	1	
+ tumor	1	
	87	87
Rigid cervix	72	
+ non-engagement of head	3	
+ tumor	1	
+ pelvic adhesions	1	
+ persistent nausea and vomiting	1	
	78	78
Rigid soft parts other than cervix	10	
+ ulcers of vagina and vulva	1	
+ stricture due to scar tissue	1	
+ atresia vagina	1	
	13	13
Edema of soft parts		5
Non-engagement of head		5
Pelvic tumors		5
Large child		3
Impending death		2
Viability of child		2
Tetanus uteri		1
Previous vaginofixation		1
Uterine inertia		1
Shoulder presentation		1
Placentary hemorrhage		1
No statement regarding indication		68
		500

It is unfortunate that the indications have not been set forth more definitely. For instance, it is not easy to determine just what is meant by "undilated cervix." Is it undilated because of some failure in the mechanism of labor, or does it mean that it was deemed inadvisable to delay the emptying of the uterus while the cervix slowly dilated? This reason for the performance of the operation was given in 111 instances. In 22 of the 111 cases other conditions besides the undilated cervix, such as narrow vagina, obesity, edema of the soft parts, etc., were given as indications for the operations.

Eclampsia alone was given as the indication in 116 cases, or over a fifth of the series. Whether or not this is good practice, it is significant as showing the increased frequency with which abdominal Cesarean section is being performed for this condition, since 85 of the operations were performed from 1908 to 1913.

Contracted pelvis was given as a reason for the emptying of the uterus by the suprapubic route in 87 cases. In 9 of these cases narrow soft parts, prolapsed cord, etc., were stated as indications in addition to the contracted pelvis.

It is rather surprising that there was not a larger proportion of contracted pelves, since until recently this obstetric complication has been thought the only justifiable indication for abdominal Cesarean section in eclampsia.

In 78 cases the operations were performed for rigid cervix with additional indications in six of the cases. In all probability this does not tell the whole story, for many of the 89 cases where the cervix was described as undilated were probably rigid in the sense that they were not readily dilatable, else the uterus would preferably have been emptied from below.

Rigid soft parts were given as indications in 13 of the cases, while in 27 cases miscellaneous indications such as

edema of the soft parts, non-engagement of the head, pelvic tumors, etc., led to the operations.

Every obstetric indication in the above list may under certain circumstances call for abdominal Cesarean section. On the other hand, certain other factors in connection with the case may absolutely contra-indicate the suprapubic operation. For example, under the indication of undilated cervix there were nine cases where narrow vagina in addition to the cervical condition was given as an indication. It is perfectly justifiable and even imperative in certain cases where the vagina is of the infantile type and prompt emptying of the uterus is indicated, to terminate the pregnancy by abdominal Cesarean section. This would save the eclamptic from the trauma and shock of a mutilating operation which would have to be done were the vagina forcibly dilated preparatory to dilating the cervix. Now one of the first principles of the treatment of eclampsia is the avoidance of shock and trauma. Upon this those who believe in the medicinal treatment of antepartum eclampsia have based their argument of non-operative interference. However, the abdominal Cesarean section would be performed for just this purpose. Quickly performed with no or with very little general anesthetic there would be less shock, far less from the abdominal operation than from prolonged attempts at delivery from below. With the elaboration of the eclamptic toxins put a stop to by the removal of the fetus and placenta, and vigorous postpartum eliminative treatment instituted, the patient will live or die dependent upon how much damage has been done by the eclamptic poison before its manufacture was put an end to by emptying the uterus.

Thus, rigid or undilated cervix plus a narrow vagina are perfectly valid indications for the performance of abdominal Cesarean section for eclampsia. However, if the patient with these obstetric complications has been repeatedly examined or if attempts have been made unsuccessfully to

dilate the vagina or cervix abdominal Cesarean section may, on account of the resulting sepsis, be absolutely contra-indicated. Under such conditions it would be far better to inflict trauma from below and deliver the woman by craniotomy.

It still remains to be seen whether eclampsia itself without additional indications, such as obstructions in the bony pelvis or the soft parts, is an indication for the emptying of the uterus by the abdominal route. Without discussing the general question of whether most is to be gained from the operative treatment of eclampsia or by treating the patient medicinally and allowing the pregnancy to tack care of itself, certainly in the present state of our knowledge there are more successful methods of treating eclampsia than by abdominal Cesarean section. Yet the figures already quoted in this paper tend to show that the time may not be far distant when the abdominal operation may show results equal to if not better than any method of treatment. For it cannot be denied that a maternal mortality of 18.68 per cent. in 91 cases of antepartum eclampsia is a remarkably good showing. So is a 15 per cent. mortality in 60 cases where the operations were performed after not more than 5 convulsions and the patients were not infected prior to the abdominal operations by examinations or attempts at delivery from below.

Nature of the Operation and Maternal Mortality. The variety of abdominal Cesarean section performed from 1908–1913 was recorded in 279 cases. In 269 of these cases the uterus was incised without removal, while hysterectomy was performed in 10 cases after the removal of the child. In 6 of the 269 cases extraperitoneal Cesarean section was performed with 3 deaths, while there were 263 classical Cesarean sections with 69 deaths. Combining these there were 269 of the conservative operation with seventy-one deaths, or a maternal mortality of 26.39 per cent., while there was no mortality from the Porro operations. At first glance this

would seem overwhelmingly in favor of hysterectomy following the sections, but again it must be pointed out that statistics with a small number of cases have only a relative value. More Porro operations in eclampsia would undoubtedly change the result, to what extent it is difficult to say. It would seem as if the indication for the Porro operation, the presence or possibility of sepsis would not often be present in the class of cases under consideration. Under such conditions far more would be gained by vaginal Cesarean section or forcible dilatation and delivery from below, craniotomy being performed if necessry.

An endeavor was made in the questionnaire to secure information on various other matters of interest in the study of abdominal Cesarean section, but the answers were so unsatisfactory and the data collected so incomplete that it has been thought best to give up the attempt to compile any accurate statistics from them. However, general impressions formed from the replies may be of some value.

Hemorrhage. As far as could be ascertained, and in fact as would be expected, there was very little hemorrhage either during or following the operation. As far as could be learned no patient died from the complication. Although it was extremely difficult to estimate the amount of blood lost by the comparatively few patients where the hemorrhage was spoken of as profuse, as far as could be judged loss of blood did not effect the maternal mortality favorably or otherwise. I merely mention this since Lichenstein has arrived at the opposite conclusion from a study of his rather small number of cases and thinks the benefit of the operative treatment comes, not from emptying the uterus, but from the blood lost during the process.

Suture Material. Catgut was the favorite suture material, since it was employed in 340 cases out of the 405 cases where statements were made regarding suture material. In half of the cases, 215, it was the only material employed

while in 125 cases it was used in combination with such sutures as silk or linen. Silk was used alone in 48 cases and eight times in connection with other material.

Causes of Death. A large proportion of the 73 deaths in the series of patients operated upon from 1908 to 1913 died from eclampsia or its sequelæ. Three patients died of shock, and one each of obstruction of the bowels and acute dilatation of the stomach. Phthisis was given as the cause of death in one case. During the same period 8 patients died from sepsis and in 7 instances the operations were performed upon patients who were moribund. While perhaps little good can come from such exclusions it is interesting to note that the total mortality, if we eliminate these last 15 patients, would be reduced from 25.79 to 20.49 per cent., and there is reason for making such eliminations since such deaths are in no way the fault of the operation selected. In spite of assertions to the contrary the eclamptic woman will not die from sepsis unless she be infected before or at the operation. Lowered resistance she may have, as have also many women who must be subjected to abdominal Cesarean section. But that we should look to her general condition for an explanation of her death from septic infection is a mistake. And surely while the operation may be called for in the interest of the child or as a forlorn hope, fatalities resulting from operating upon dying women should not be counted against any operation performed for any purpose.

Summary and Conclusions. 1. Since the 500 cases of abdominal Cesarean section represent the work of 259 operators they are a very fair index of the present status of the operation as a method of treating antepartum eclampsia.

2. Since the results of operative obstetrics, especially abdominal Cesarean section, are far better at the present time than formerly, the value of the operation as a method of treatment of eclampsia can only be judged by grouping the cases chronologically.

3. Between 1908 and 1913 there were 283 cases of eclampsia treated by abdominal Cesarean section with 73 deaths, or a maternal mortality of 25.79 per cent. Up to 1908 there were 198 cases with 95 deaths, or a mortality of 47.97 per cent. Hence the maternal mortality in the five-year period has been reduced nearly one-half.

4. Hence the old figures of a 40 or 50 per cent. maternal mortality from abdominal Cesarean section for eclampsia are incorrect and should no longer be quoted.

5. The mortality percentage quoted above (25.79) can be considerably lowered by care in technique and by not making use of the suprapubic route when there is great probability that the woman has been infected from below.

6. Nearly one-fifth of the entire series, 91 operations, were performed by thirteen men having five or more cases to their credit, with 17 deaths, or a maternal mortality of 18.68 per cent.

7. Deducting 15 cases where the proportion of moribund and septic patients was very high, the remaining 76 cases with 10 deaths give a maternal mortality of 13.15 per cent.

8. Although an eclamptic may die after a single or survive after many convulsions, the latter must be utilized as an indication of the degree of eclamptic poisoning until we have a better method of estimating the patient's condition.

9. Emptying of the uterus either spontaneously or by artificial means, while it puts a stop to the further elaboration of toxins from the fetus, the placenta or both may not be sufficient to prevent further convulsions or in certain cases death of the mother from intoxication. In other words, so great has been the effect of the poison that convulsions continue after delivery or death ensues in spite of the relief afforded by emptying the uterus.

10. In the present series, convulsions ceased after abdominal Cesarean section in 251 out of 457 cases or in 54.92 per cent. These statistics agree with those made up from those

obtained from thousands of cases of eclampsia showing that convulsions cease after the emptying of the uterus either spontaneously or artificially in from 52 to 62 per cent. of the cases.

11. Even when the convulsions cease after delivery a certain proportion of the patients die. In 146 cases where the convulsions ceased after abdominal Cesarean section during the five-year period (1908–1913) there were 41 deaths, or a maternal mortality of 19.8 per cent.

12. While the above percentage of patients died after emptying the uterus by abdominal Cesarean section after cessation of the convulsions the mortality is much less than where the convulsions continue, since in 130 of such cases there were 41 deaths, or a maternal mortality of 31.53 per cent.

13. The operative treatment of eclampsia has never been given a fair trial. To do this the uterus should be emptied quickly, as soon as possible after the onset of the first convulsion, not emptied after all kinds of medicinal treatment have been tried and failed.

14. In the present series there were 25 deaths after 124 operations, performed after one to five convulsions, or a maternal mortality of 20.32 per cent.

15. The best results in the operative treatment of eclampsia are bound to follow immediate emptying of the uterus in cases where the woman has not been infected by frequent vaginal examinations or attempts at delivery from below. This is shown by the following:

16. In 60 of the 124 cases where the operations were performed after from one to five convulsions, where no or only one or two vaginal examinations had been made, and where no attempts were made to deliver from below there were only 9 deaths, or a maternal mortality of 15 per cent.

17. The increase in mortality due to delay is shown by a mortality of 30.33 per cent. where the operations were per-

formed after the sixth convulsion. This is 10 per cent. higher than after quick delivery and 5 per cent. higher than the total mortality resulting during this same period (1908–1913).

18. In 60 cases where the convulsions ceased after operations performed after from one to five convulsions there were 8 deaths, or a maternal mortality of 13.33 per cent. The mortality is twice as high (26.92 per cent.) after operations performed under the same conditions except that the convulsions continued.

19. When the abdominal Cesarean sections were performed after more than five convulsions there was a resulting mortality of 26.31 per cent. where there was cessation of the convulsions and 36.36 per cent. where they continued.

20. The average number of convulsions in 386 cases of eclampsia in the abdominal Cesarean series was 9 where the cases were not grouped. The average was 10 up to 1908, and 8 from 1908 to 1913.

21. Twins occurred 21 times in 500 cases of abdominal Cesarean section for eclampsia, or in 4.02 per cent. of the cases. This is over three times as frequent as are twins in normal cases.

22. Excluding premature children and counting all children as living who survived one hour after delivery there were 9 deaths from 1908 to 1913 where 248 children were delivered by abdominal Cesarean section, or a fetal mortality of 3.62 per cent. Under the same conditions the fetal mortality was 10.69 per cent., if children dying the first three days after delivery be counted among the deaths. Even estimating the fetal mortality by this method it is much better than by any other method of treating eclampsia.

23. The fetus as well as the mother is affected by the eclamptic poison. The greater the number of the eclamptic convulsions before the delivery the greater the fetal mortality. Hence for the sake of the fetus the uterus should be

emptied as soon as possible after the first convulsion. If other factors in the case call for abdominal Cesarean section the chances of the fetus will be much better than if another method of delivery be employed.

24. In 474 patients with eclampsia in the present series, 83.75 per cent. were primparæ and 16.17 per cent. multiparæ. The relatively larger proportion of primiparæ was due to the fact that primparous conditions, such as undilated and rigid cervix and rigidity of the soft parts, more often called for the abdominal operation than for other methods of delivery.

25. The maternal mortality is higher after abdominal Cesarean section in multiparous women than is the case with primiparous eclamptics. In the present series in 225 primiparæ the maternal mortality was 24.44 per cent. while in forty-eight multiparæ the mortality was 27.08 per cent.

26. The fetal as well as the maternal mortality is higher in multiparæ after abdominal Cesarean section. This is probably due to the greater degree of intoxication among the multiparæ since in both primiparæ and multiparæ the children, because of the nature of the operation employed, escape the traumatisms of labor. The greater intoxication among the multiparæ is probably due to their being on the average older than the primiparæ, the average age of the former in seventy-seven cases being 32.6 years while the average age of the latter in 397 cases was 24.6 years.

27. The maternal mortality in eclampsia after abdominal Cesarean section steadily increases with the age of the patients, it being 23.63 per cent. between the ages of sixteen and twenty, and 31.11 per cent. between the ages of thirty-one and thirty-five.

28. The number of eclamptic cases in the present series steadily increased from the fifth month of gestation up to full term, also the farther advanced the pregnancy, the lower the maternal mortality.

29. Unless the aseptic technique employed in attempts to deliver from below be known, abdominal Cesarean section is contra-indicated, so great are the dangers of fatal peritonitis when the patient is infected.

30. The high death rate of abdominal Cesarean section after operative procedures is shown by the fact that there were ten deaths in twenty-nine such cases, or a maternal mortality of 34.48 per cent. This 9 per cent. increase in mortality over the total mortality (25.79 per cent.) during the same period was undoubtedly due to sepsis, shock, and delay in emptying the uterus.

31. The mortality is distinctly higher after abdominal Cesarean section in eclampsia if vaginal examinations have been made prior to the operations. The danger increases directly with the number of examinations made and the lack of asepsis employed.

32. Any obstetric condition which makes delivery by the natural passages prolonged and difficult may be an indication for abdominal Cesarean section in eclampsia. If delivery be decided upon the uterus should be emptied by the method which will perform the work the quickest and with the least trauma and shock to mother and child. However, it must be borne in mind that there is more danger of sepsis when the peritoneal cavity is opened.

33. With the present state of our knowledge of the results of abdominal Cesarean section for eclampsia it cannot be denied that older and more tried methods of emptying the uterus in eclampsia give better results in eclamptics with normal pelves and soft parts, hence should not be lightly discarded in favor of the more brilliant and more easily performed abdominal operation.

34. But with a maternal mortality after abdominal Cesarean section of 18.68 per cent. in 191 cases of eclampsia in one series, 13.13 per cent. in seventy-six cases in another, and 15 per cent. in sixty cases where the uterus was emptied after

a few convulsions, the operation under consideration has reached a stage where it can no longer be disregarded by obstetricians who have based their opposition to the procedure upon statistics which were altogether too high.

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DISCUSSION

Dr. Edward P. Davis.—Mr. President: I have listened with great interest to Dr. Peterson's paper, and I desire to present the subject with a different stand-point, but not at all from an antagonistic view.

The decisive value of eclampsia as signifying a dangerous condition of the patient is by no means accepted by many obstetricians. The pulse tension, the condition of the urine, the state of the blood, the condition of the lungs, as ascertained by physical examination, are of more value than the recurrence of one or several eclamptic convulsions as indicating the serious state of the patient. Again, eclamptic convulsions have done much by their pathological importance and the wide attention given to puerperal eclampsia to obscure our knowledge of this condition, for it is not the eclamptic convulsion which is the prime source of danger, but the toxemic state. Eclamptic convulsions are an effort on the part of nature, if we study our cases carefully and in large number, to bring about a cure of the toxemia, oftentimes by ridding the woman of the fetus, by

lowering pulse tension, inducing hemorrhage, and causing free secretion; hence, the eclamptic convulsion is a rational result of the toxemia and sinks I think from this standpoint somewhat from its exalted place in our pathological consideration. The question then is, Under what circumstances shall the toxemic woman, who has come to the culminating point of toxemia, be delivered, by abdominal Cesarean section, or vaginal Cesarean section, as Dr. Peterson has brought before us? We have in direct contrast to this delivery by operation the results obtained in large clinics throughout the world, at the present time, by two means of treatment of the toxemic condition: the first of which is that of Zweifel and Lichenstein by bleeding, followed by intravenous salt solution, which is a rational method in the treatment of toxemia culminating in eclamptic convulsions, which gives a mortality of less than 7 per cent., and in that clinic there is published an authentic series of sixty cases without maternal death, which contrasts favorably with sixty other cases collected by Peterson with a considerably higher maternal mortality. So insidious is the nature of toxemia that fetal life may be left out of consideration in determining upon a method of treatment as to whether or not at the first convulsion it shall be abdominal Cesarean section. In typical eclamptic convulsions we should reason for the mother alone in treating this condition. Again, in direct contrast and in competition with the efforts of the German school we have the expectant method of Stroganoff, which has been extensively used abroad, declined by some and adopted by others, but whose definite results show a death rate between 6 and 7 per cent., and this without the employment of free bleeding. Delivery must not be neglected as a means of treatment of toxemia culminating in eclampsia, because the removal of the fetus is the method of nature in the majority of cases to end the toxemia by crisis. The results show that the treatment of toxemia is first, and that delivery should be practised in accordance with the natural history of the case, and that many cases are delivered safely following a simple rupture of the membranes in multiparæ, and others by the use of forceps with three-fourths dilatation, and some by craniotomy in septic cases, and it would be improper to talk about abdominal or vaginal section as the only method of operative treatment in this connection.

Dr. Peterson has done great service to bring before us this

matter for revision, for so perplexing a topic requires frequent study and collection of material from wide experiences. It seems evident the treatment of toxemia by the method of simple sedation, the Stroganoff method, and by the method of bleeding and transfusion, give a comparatively low mortality provided the obstetrician stands ready to deliver upon the incidence of labor, or when treatment of the toxemia fails to control the onward progress of the disease. When it becomes evident that a woman will not deliver herself, that she requires assistance, then let vaginal examination be made; let the condition of the genital passages be ascertained, and should there be obstacles to delivery, unquestionably Cesarean section, vaginal in the early months of gestation, abdominal in the later, is the operation of choice. In cases of septic infection from neglected or abused labor, resort may be had to craniotomy or embryotomy, or delivery by abdominal Cesarean section, followed by the removal of the body of the uterus. In this direction, it seems to me, our progress lies. So we accept Dr. Peterson's 25 per cent. mortality from abdominal Cesarean section in the later years of the history of Cesarean section as one method of treatment applied to cases of toxemia that reached the stage of crisis, but this is not, as he himself says, a complete review of the situation. Personally, in Cesarean section I have had 150 cases of all sorts, and I have nothing to say upon the question of abdominal Cesarean section for eclampsia, for I have not done a sufficient number of sections for that purpose to believe that my results are of special value individually. I gave them gladly to Dr. Peterson to go into the general collection. I operate whenever the indications seem to me to warrant operation, and I believe that delivery by vaginal or abdominal Cesarean section should take the place of forcible dilatation and of prolonged examinations and delays which have been so fatal in parturient cases.

I wish again to voice my appreciation of the work which Dr. Peterson has done in the last few years in bringing before the Society and our profession so important a contribution to our knowledge.

Dr. Barton Cooke Hirst.—Dr. Davis has expressed my feeling exactly. In more than 200 cases of eclampsia in the University Maternity and in 100 more during a twenty years' service in the Philadelphia Hospital, ten years in the Maternity

Hospital of Philadelphia, and twenty-five years' experience as a consultant and in private practice, I have only resorted to operative delivery, as a rule, in those cases in which the conservative treatment failed to produce decided improvement in a reasonable time, although operative treatment appeals to me more than conservative treatment. My work is mainly operative of late years, and a considerable experience with Cesarean section gives me a strong predilection in its favor. But whenever I have treated series of cases of eclampsia by operative measures, the mortality has increased, whereas by conservative treatment, such as elimination, reduction of blood-pressure, sedatives and venesection, I can keep the mortality lower than by operative procedures. In the Pennsylvania University Maternity the mortality runs about 10 per cent., excluding those cases that die within twelve hours from the time of admission to the hospital, as they are usually moribund, and it is not fair to include them in the statistics. I cannot get as low a mortality from operative treatment and Dr. Peterson's statistics would not lead us to expect it.

There is another way of looking at this subject which is interesting. Suppose we take 100 patients with eclampsia and operate on every one of them; we will have done an unnecessary operation in at least 90 cases, as those 90 would doubtless have recovered under conservative treatment. And judging from Dr. Peterson's statistics, there would have been more than ten deaths in the series, some of which would have been due to the operation and not to the eclampsia.

Dr. Peterson has done a great service in directing attention to the place operative procedures must have in the treatment of this condition. As Dr. Davis has said, I feel also that a certain proportion of cases must be treated by some operative plan of delivery. My clinical rule in the average case, in a parturient eclamptic, is to puncture the membranes: nothing reduces the blood-pressure so quickly and so much. After that comes diaphoresis, purgation, sedative drugs, venesection, if the blood-pressure is 180 or over. My experience is that the labor ends spontaneously in eight hours in the majority of cases during the energetic application of the conservative treatment. If at the end of say twelve hours' spontaneous delivery is not hoped for within a reasonable time, operative measures should be considered. If an operative delivery is then selected the

patient with eight or ten hours of precedent eliminative treatment, including the sweat bath, does better, I find, than if operated on at once.

There is another feature the Society should consider. Some of the members have pointed out that the Cesarean section is so facile, so attractive and so easily done by any surgeon, that it is unquestionably in danger of being somewhat abused; should we not be cautious not to justify such abuse?

I was interested during a recent visit to a smaller city, to find that it was the habit for the physicians of that city to send all eclamptic cases to a general surgeon without any obstetric experience, who immediately opened the abdomen and delivered the baby by Cesarean section. There is this tendency, I think, in many places. I have certainly seen it in Philadelphia, where one of my friends among the general surgeons treats all cases referred to him in this way and actually advocates the abdominal route for evacuating the uterus for any indication even as early as six or eight weeks. This tendency we should discurage. Abdominal Cesarean section should be done in exceptional cases of eclampsia, undoubtedly, but there should be some other indication than the mere existence of toxemia.

Dr. J. Whitridge Williams.—My views are much those of Dr. Davis and Dr. Hirst. I have in the last few years made venesection the prime treatment of these cases as soon as the women come into the ward. We bleed them extensively, 700 c.c. or 800 c.c., and replace the lost blood ordinarily with salt solution, and in a large proportion of cases normal recovery ensues. But if afterward the bleeding woman does not improve, we then empty the uterus by the most conservative method at our disposal, and that, of course, will depend altogether on the condition of the birth canal. We have done in my service two or three Cesarean sections under these circumstances and that shows I do not think it is indicated in a large number of cases; but when we get a primiparous woman, with rigid soft parts, or a primiparous woman with a pelvis under normal size and likewise rigid soft parts, I take it, in such a case abdominal Cesarean section is indicated. If improvement does not follow promptly after venesection, I do not wait for eight hours. If improvement is not manifest in a short time we interfere, but Cesarean section once in twenty-five or thirty cases of eclampsia is all I consider necessary.

CAN SURGERY BE ELIMINATED IN THE TREATMENT OF FIBROID TUMORS OF THE UTERUS

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If the query propounded in the title of this contribution was put to a vote of this Society, I believe that the verdict would be that the paper could be completed in one word, No. Unfortunately, there is developing, in the profession at large, a more or less general belief that all fibroid tumors of the uterus can be cured, with less danger to the patient by röntgentherapy than by surgical procedures. On account of this growing opinion I deem it not amiss to bring the subject before this Society in the hope that the seal of its authorative approval will be placed upon surgery as the proper treatment of these tumors unless, for certain definite reasons, such treatment is contra-indicated in a given case.

That röntgentherapy has a place, and a very important one, in the treatment of myomas is not to be denied, but I hope to prove that there is no justification for the view that surgery should be entirely supplanted. It may be stated in passing that this opinion is not held by leaders of American surgery and röntgenology. In the preparation of this paper, letters embodying a series of questions were sent to 100 of our best-known surgeons and gynecologists and to a like number of the members of the American Roentgen Ray Society. Replies were received from 44

surgeons and gynecologists, and in reply to the question "Do you believe that all cases of fibroid tumors of the uterus (not including the submucous) should be treated by the *x*-rays?" all answered in the negative. The same question was propounded to the röntgenologists, and out of 62 answers received, 9 answered in the affirmative, 25 in the negative, and 28, on account of lack of experience with the method, expressed no opinion. Of the 9 who answered yes, 2 so qualified their answer that they should really be counted among the negatives. A close study of the voluminous literature of this subject gives no justification for the view that the *x*-rays are preferable to surgery in the treatment of all cases of uterine fibroids. Inferentially, however, many of the papers published, do express this opinion and as a result this view is being generally accepted as true.

In the beginning it may be well to discuss the relative value of the two methods as to cure. A cure, I take it, means not only the relief of symptoms but the complete removal of the tumor. The results of röntgentherapy has been reported by Mohr, who gives an analysis of 796 cases so treated, with known results in 669. Of these he reports as cured 376, or 56.2 per cent.; improved, 208, or 31.1 per cent.; unimproved, 74, or 11.1 per cent.; relapsed, 7, or 1.0 per cent.; dead, 2, or .29 per cent. Of 380 cases studied from the stand-point of reduction in size, 81, or 21.3 per cent., were unchanged; 219, or 56.6 per cent., showed a slight decrease; 52, or 13.7 per cent., were considerably reduced; 20, or 5.3 per cent., entirely disappeared; in 3, or .8 per cent., there were subjective sensations that the abdomen had become smaller; in 5, or 1.3 per cent., the tumors increased in size. If we study this report we will note that while the claim is made that 56.2 per cent. of the tumors were cured with a mortality of but 0.29 per cent., in reality but 20 or 5.3 per cent. were completely cured.

What can surgery show as to cure? I believe it must be admitted that, except in those cases which die as the result of the operation or are not cured on account of recurring malignant disease, hysterectomy cures all cases permanently. Hysterectomy, however, is not without its dangers. Hysterectomy for uterine fibroids has a definite mortality which varies, it is true, with the skill of the individual operator as to his technique and selection of his cases. One of the questions asked the surgeons was, "What do you consider an average mortality in the surgical treatment (hysterectomy) of fibroid tumors of the uterus? The answers indicated an average of 2 per cent. A study of the reports of twenty-one Philadelphia hospitals for one year showed records of 494 cases treated by hysterectomy with 17 deaths, a mortality of 3.8 per cent. This, I take it, is a fair average mortality, though practically all the papers on the value of röntgentherapy place the surgical mortality at 5 per cent.

The following question was also asked the surgeons, "In what percentage of your cases have you found malignant degeneration. The replies varied from 1 to 10 per cent., and the combined figures would indicate an average of about 5 per cent. The röntgenologists, quoting from previously reported papers by Noble, McDonald, etc., place the frequency at 2 per cent.

Now if we accept the high primary mortality of 5 per cent. and the low percentage of 2 per cent. for malignant degeneration, and admit, for the sake of argument, that no case of malignant degeneration is cured by surgery, we have as the result of hysterectomy, 93 per cent. of absolute cures as against 5.3 per cent. for roentgentherapy. This conclusion may be criticised on the ground that we should accept as cured by röntgentherapy the first published figures of 56.2 per cent. Even admitting these figures, there is no comparison as to the value of the two methods. What right have we, however, to assume that the 94.7 per cent. of the

tumors which were not removed will not at some future time take on the various degenerations and complications as will ultimately destroy the host? The trouble has been that only the relative immediate mortality of the two methods have been compared and not the ultimate results.

It must be admitted that the immediate mortality of hysterectomy is higher than that of röntgentherapy. In spite of this, however, we must take this extra hazard as we are not justified, at the present time, of discarding a certainty for an uncertainty.

Is the use of the *x*-ray treatment without danger? One of the questions asked the röntgenologists was, "What, if any, are the dangers of *x*-rays in the treatment of fibroid tumors of the uterus?" Practically all the answers indicated that the only danger to be feared was the production of an *x*-ray dermatitis. Every one, however, emphasized the fact that the work must be done only by skilful men. The danger to be expected in the hands of the unskilled operator was not only burning, but the stimulation of the growth of the fibroid and the increasing of malignant degeneration if it happened to be present. I am reliably informed that there are in use in the United States 20,000 *x*-ray machines and but comparatively few competent operators. We have never been able to control the surgical treatment of disease. Men are operating all over the breadth of this land without adequate surgical skill or equipment. There is no reason to believe that röntgenologists will be able to control the situation any better than the surgeons. Wait until it becomes generally known to every man with an *x*-ray machine in his office that fibroids have been cured by röntgentherapy and see the mortality jump. If tumors are to be treated by the rays then the treatment should only be undertaken by men who are competent to do the work.

The view that burning is the only danger of the treatment is not universally accepted, however, by röntgenologists.

The *Archives of Roentgen-ray*, June, 1913, speaks editorially as follows: "So far there has been little or no recurrence, but, of course, a considerable period must elapse before we are in a position to judge definitely of the value of the treatment and the safety of such enormous doses. When we consider the important tissues, intestines, peritoneum, bloodvessels, and glands which must also be subjected to intense radiation, we realize how necessary it is to proceed with a good deal of caution." Henry Beders drew attention to the possible injury to the intestines during irradiation of the pelvis and especially to the glands of Peyer's patches. Haenisch says it is doubtful if very anemic women should be treated, as bleeding may be increased; two fatal cases have been recorded.

Danger may also result from treating unsuitable cases. Bordier gives the following contra-indications: When the fibroid is calcified or presenting necrobiotic changes. Those which are malignant, infected, or gangrenous, or in the presence, if such complications as pyosalpinx or pelvic peritonitis.

In order to obtain the opinion of American röntgenologists as to these contra-indications the following question was presented: "What would be the probable result of *x*-ray therapy on (*a*) malignant degeneration; (*b*) cystic degeneration; (*c*) necrosis; (*d*) infection (of the tumor). There was no unanimity of opinion expressed, but it struck me as rather remarkable that seventeen of the answers stated that the rays would benefit all of these complications. Practically all of the answers stated that the effect on malignancy would be retardation or possibly cure, though several emphasized the stimulation of the process if the treatment was improperly done. A few answers indicated that cystic degeneration would result in calcification, though the majority stated that the process would be increased. It was generally conceded by the majority that necrosis and

infection would be made worse by the treatment, and that these complications were a positive contra-indication to the treatment.

In connection with this phase of the subject the surgeons were asked, "In what percentage of your cases are you able to diagnose before operation: (*a*) malignant degeneration; (*b*) cystic degeneration; (*c*) necrosis; (*d*) infection?" The röntgenologists were asked, "Do you believe it advisable to have a gynecologist examine all cases of fibroids before beginning the *x*-ray therapy?" These two questions were asked for definite reasons. In the majority of papers on this subject presented by röntgenologists the opinion has been expressed that a gynecologist should examine all cases before the beginning of treatment so that these various complications could be eliminated. My purpose in asking the surgeons the question I did was to show, what I have personally experienced, that it is only possible to make a full and correct diagnosis at the time of operation, and hence that such an examination under ordinary circumstances is without much value. I was not disappointed in the replies I received from the surgeons. Practically all agreed that a correct diagnosis is usually impossible before operation.

With but a few exceptions the röntgenologists answered "yes" to the question. The principal reason given being that unless a competent person examined the patient unsuitable cases would be accepted for treatment. A few, from their answers, undoubtedly classed the gynecologists as "doubting Thomases," as they expressed the opinion that the need of the gynecologist was to testify that a tumor had been present before treatment.

It is interesting to note that the various complications which render *x*-ray treatment unsuitable are the very ones that are responsible, in a great measure, for the high mortality rate of hysterectomy. In plain words surgery has to assume the responsibility in the very serious cases which

the *x*-rays would make worse. I venture the assertion that the mortality from hysterectomy, in competent hands, in the uncomplicated fibroids of the uterus would compare very favorably with that of uncomplicated appendicitis. If the complicated cases were eliminated from surgical statistics there would be little reason to advocate anything to supplant it.

The most important question in this whole subject is that relating to a consideration of the various phases of malignancy associated with fibroid tumors of the uterus. Probably the most important paper of the subject is that of Miller, "The Relation between Sarcoma and Myoma of the Uterus and its Bearing on *X*-ray Therapy of Uterine Myoma." It is practically impossible to estimate with any accuracy the frequency of malignant degeneration as a complication of uterine myoma. Miller gives a table taken from the reports of many authors and arrives at the conclusion that sarcoma occurs in but practically 2 per cent. of cases. There is no mention made of the frequency of carcinoma. McDonald estimates the frequency of the latter complication as 3.7 per cent. As previously stated, I asked the surgeons how often they had found malignant degeneration in fibroid tumors. The answers varied, but the average frequency was about 5 per cent. I am perfectly satisfied that if a thorough routine pathological examination was made of every fibroid removed we would find the incidence of malignant disease much higher than reported, and consequently the frequency of recurrence after operation much less. In a personal communication Dr. Stephen Tracey, who has made such a study in his own cases, tells me that he has found associated malignant disease positive by histological study in 10 per cent. of the cases.

Miller's conclusions are as follows:

1. Sarcoma may be said to occur in about 2 per cent. of all myomatous uteri.

2. The primary mortality of the operative myoma therapy is still about 4 to 5 per cent.

3. A lasting cure of sarcoma of the uterus by the operative treatment can only be expected in 25 per cent. of the cases at the most.

4. Considering the advantages of the *x*-ray over the operative treatment in regard to assured freedom from fatality, mistakes in the diagnosis of sarcoma amounting to 0.8 per cent. make little difference.

5. When the public learns that not every tumor of the uterus demands operation, but that there are also efficient conservative methods, we shall certainly be in a position to get hold of more malignant growths in the curable stage.

In view of the above facts I believe there can be no further doubt that a routine operative treatment of myoma of the uterus, for fear of sarcomatous degeneration, need not be carried out. The "ghost should be buried at once."

These conclusions are specious but they are not justified. Admitting that sarcoma occurs in but 2 per cent. of cases and that the mortality of hysterectomy is 5 per cent., surgeons are not getting that mortality because they are operating on account of the fear of sarcoma alone. Sarcoma uncured is not the only thing that kills these patients. What about carcinoma, necrosis, infections, torsion of the pedicle, intestinal adhesions and obstruction, and all the other complications that may occur? The reason we have such a high surgical mortality is because we have to operate in grave emergencies in many cases in order to save life. It is not fair to compare the total surgical mortality with the incidence of any one complication, and to say that because the complication occurs less frequently than the mortality that the treatment should be discarded. These conclusions, of course, do not say this in as many words, but the application of the principle means just this. Particular exception is taken to conclusion number 5. I take

just the opposite view, for I believe that as soon as the public learns of such a teaching they will not submit to surgery but will delay operation until the growth has so far developed as to be inoperable. I read this conclusion to mean that the cases of malignant degeneration will come to the röntgenologist for treatment while the growth is still in the curable stage. If my understanding of the statement is correct, then it means, in no uncertain language, that surgery is to be eliminated in all cases of malignant disease of the uterus, forsooth because the primary mortality of operation is higher than the primary treatment by *x*-rays. If this is true of the uterus then it is true of malignant disease of every organ of the body. I have the greatest regard for the efficacy of radiation in the treatment of cancer but I believe there are but few men who would have the temerity to discard surgery in the treatment of malignant disease. Surgery is not ideal in the treatment of cancer but it far and away superior to any other method of treatment in the early stages of the disease.

The question of the limitations of the two methods is worthy of discussion. Surgery is, practically, only limited by the general condition of the patient. Röntgentherapy on the other hand is limited to a great extent by conditions in the tumor itself. The various complications as offering a contra-indication, have already been mentioned. Another contra-indication to the use of the rays is the age of the patient. Most authorities are in accord that the best results are obtained from the irradiation in woman at or after the menopause. In women under forty the *x*-ray treatment is, generally, not applicable for the reasons that recurrences are apt to occur, that it takes too long to abolish symptoms, and is therefore too expensive, and that it means sterilization of the woman. On the other hand this is the most favorable time for surgery. If all fibroids were operated on early before the various heart changes had taken place and before

the various degenerations and complications in the tumor had manifested themselves the mortality would be 1 per cent. or less. Again, it is often possible in the young woman, with an uncomplicated fibroid to save her ovaries and enough endometrium to preserve for her the menstrual function. It should be unnecessary to say anything in reference to the treatment of the small pedunculated submucous polyp and the small growths that can be cured by myomectomy with the preservation of the fecundity of the woman. Here it must be admitted that surgery is in a class by itself.

It may seem that I am unalterably opposed to the use of the *x*-rays in the treatment of fibroid tumors of the uterus. Such a conclusion is far from the fact. As I stated in the first part of my paper I believe they have a most important place in our therapy. In order to establish this field the following question was asked both the surgeons and roentgenologists: "Under what circumstances do you advise the *x*-rays in preference to surgery?" Seventeen out of forty-four surgeons who replied, answered that they never advised it under any circumstances. The general context of the other answers from surgeons was that it was to be advised when the woman, as a result of serious heart or kidney disease or grave anemia was a poor surgical risk. The replies from the röntgenologists expressed a variety of opinions. Several stated that they always advised it in preference to surgery. Others that they never advised it in preference to surgery when surgery was possible and acceptable. Still others when no complications existed that would require surgery and contra-indicate the use of the *x*-rays. A few would only advise it after the age of forty in uncomplicated cases. The consensus of opinion seemed to agree with that expressed by the surgeons that its greatest field of usefulness was in those cases where surgery would be particularly hazardous.

Apparently there is no question as to the value of the *x*-ray treatment in certain classes of fibroid tumors of the

uterus. It has been definitely proved that röntgentherapy has, with but few exceptions, controlled bleeding from myomas and has also reduced the size of the tumors, in a certain percentage of cases where it has been used.

Many women with fibroid tumors of the uterus are poor surgical risks on account of anemia or associated heart, kidney, pulmonary, and other general conditions. To operate on many of these cases is to take an unnecessary risk, when we have a method which even it does not cure at least will relieve dangerous symptoms. We realize that in many cases so treated the dangers of future development are present in spite of treatment, but we take the chance of betterment on account of the grave danger to life from an operation. Again, we find many women, and we will find many more in the future, refuse surgical intervention. These should be subjected to *x*-ray therapy for the reason that in competent hands the possibility of being benefitted is much greater than if nothing was done for them. In the gravely anemic cases, the *x*-rays should be used to control the bleeding and enable the patient to get into proper condition for surgical intervention.

Conclusions. 1. Surgery is the best treatment in fibroid tumors of the uterus and cannot be supplanted by any other known form of treatment.

2. Röntgentherapy has an important place in the treatment of these tumors.

3. Surgeons and röntgenologists should not enter into competition with each other but should work hand in hand for the relief of womankind.

DISCUSSION

Dr. Joseph Brettauer.—This is an extremely interesting paper on an important subject, but I do not think it is ripe for general discussion. I do not know of any members of this Society who are willing to go on record as stating either the pros or cons definitely. I think I was one of the first to have fibroids of the uterus treated by *x*-rays, not with the intensive raying of today, but with frequent raying. We intended at that time no cure of the fibroids, *i.e.*, their disappearance; we only tried to get symptomatic relief "for profuse metrorrhagia or possibly menorrhagia," and the results were very favorable in about 45 or 50 per cent. of the cases so treated. There were 64 cases treated in all.

Since we have adopted the Freiburg method and that method strictly, using the Krönig-Gauss apparatus, the number of cases subjected to this treatment so far is limited. The time elapsed is too short for making a final report, but I can say this, and I am ready to substantiate it, that when the cases are properly selected, and then properly treated by this method, the results are invariably good, amenorrhea being the effect desired. In older women who are near or at the climacterium, this object will be reached by three or four series; in younger women seven, eight, or nine may be required.

As to the selection of cases for treatment, I fully agree with the reader of the paper, and I would state, further, that I stand today where I was twenty years ago in regard to fibroids, that is to let them alone if they do not cause any symptoms. My personal experience has been that about one-half the cases of fibroids cause no symptoms whatever and consequently were not treated, but merely kept under observation.

Profuse metrorrhagia or menorrhagia, marked interference with the functions of the bladder or rectum, rapid growth, pain radiating down the thighs in some instances, were the symptoms which made interference advisable. Of these cases about one-half were subjected to deep *x*-ray treatment. They were mostly women at or near the climacterium, and in all there was no doubt as to the correctness of the diagnosis. Sufficient time for observation had elapsed to definitely exclude malignancy in any form and diseases of the appendages. The

two latter points I consider of utmost importance, when the question of *x*-ray employment is under discussion.

Dr. Robert L. Dickinson.—Having brought before the profession in America a summary of the foreign literature on this subject, in November, 1912, when hardly anything had appeared here, and having followed up several cases under such treatment, as well as having discussed this matter a good deal, I would like to make clear again what was said in that brief review in *Surgery, Gynecology, and Obstetrics*, which seems not to have fertilized:

"There is a very definite statement on the part of most men of large experience that there are proper and improper cases. We can disregard the 2 per cent. of cervix cancer, and 1 per cent. of body malignancy." We may, I think, agree with Menge when (in *Monatschrift f. Geburtshülfe und Gynäkologie*, 1912, xxxv, 3, 268) he groups the myomata calling for operation as follows: "Large, rapidly growing tumors; all submucous polypoid growths; adenomyomata; cases infected and degenerating, or those suspected of malignancy; younger women (below forty), with free bleeding and rapid development (leaving the ovaries), and lastly, myomectomy for the few younger individuals keenly desirous of children." That would seem to exclude the bulk of cases from *x*-ray treatment, but the fact is that the greater number of fibroids occurring in women fall in the class of those over forty, with "practially stationary tumors not causing kidney or heart blockade or crowding the pelvis." Moreover, there are not a few "women deeply anemic, diabetic, nephritic, bronchitic, arteriosclerotic, or with bad hearts or large thyroids" with whom the method is worthy of trial. Krönig and Gauss talk about 100 per cent. applicability, but they do not apply it. I have had cases go to Freiburg. It develops that the highly neurotic woman is a bad subject for the treatment, whether it be that a three- or four-hour session is too much for the American nervous system or that the *x*-ray menopause, from shrinkage of the ovaries, is as calamitous as the surgical menopause from their removal. In practice one finds the American woman dreading the *x*-rays as much as an operation. "What will it do to my ovaries?" is the query. She is afraid of its effect. Therefore it is as easy to get consent to a laparotomy as to institute *x*-ray treatment.

The Gauss method is a method of great power, which very

few American operators are skilful enough to use. Burns and colitis frighten the patients.

My personal experience has been that those cases that have submitted to the *x*-rays have made progress; the hemoglobin has risen, the menorrhagia has lessened or ceased, the pelvic discomfort has diminished, and the tumor has remained stationary. Let us select our cases. The treatment may not be as applicable to American conditions as it is to those in Freiburg.

Dr. James R. Goodall.—Dr. McGlinn's paper has proved interesting to me. It is particularly interesting in one feature, and that is the incidence of malignant disease in fibroids. According to statistics from surgeons this complication arises in about 5 per cent. Dr. McGlinn reduces it to 2 per cent. That is interesting from the fact that it is completely out of harmony with my own findings in this condition. I have carefully examined every fibroid that has been removed in the Royal Victoria Hospital and two other hospitals in Montreal during the last twelve years, and only in the last six months have I demonstrated one case of sarcoma developing within a fibroid. This one case arose within the last six months. About two years ago a classmate of mine working in one of the larger hospitals of New York City examined over 300 cases of fibroids collected from the museum and made sections of each of them and reported an incidence of 7 per cent. I wrote to him about it and told him my experience, and he forwarded the sections, and I can frankly say not 1 per cent. of them were malignant.

About a year ago in one of the largest cities of America my colleague had the good fortune to go there when a society meeting was being held, and one of the prominent men of the city had under the microscope sections from seven fibroids which had undergone malignant disease, and these seven had occurred within the last 6 months of his surgical practice. He saw the sections and was firmly convinced that they were richly cellular fibromyomata, and one of the most prominent pathologists in the United States today happened to be there on a trip at the time, and stated that not one of the sections showed malignancy. I have carefully reviewed at least 700 cases of fibroids in the last twelve years, and the incidence has been only one in 700. Whether that can be attributed to local conditions I am not prepared to say.

Dr. William P. Graves.—I should like to confirm what Dr. Goodall has just said with reference to malignant degeneration of fibroids. Up to a very recent date the incidence of sarcomatous degeneration in my own series was supposed to be in the neighborhood of 5 per cent. I had personally made examinations of most of these cases and had pronounced them sarcoma. A recent case, which I will not describe, a very important one, was one in which a diagnosis of sarcoma was made by me, but in order to make sure of it I sent a section to one of the best pathologists in Boston, who returned the diagnosis that it was simply a rapidly growing fibromyoma. I am therefore having all of my cases revised, and find that some of the sections which were pronounced sarcoma are in reality not malignant. I do not know yet what the exact percentage of sarcomatous degeneration is, but it will indoubtedly be very small.

THE EFFECT OF LAPAROTOMY UPON THE CIRCULATION

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(By Invitation)

Under normal conditions the abdomen contains from 35 per cent. to 40 per cent. of all the blood in the body. The liver alone contains about 29 per cent., and the intestines about 6 per cent. of all the blood. Furthermore, the capillary and venous channels of the abdominal organs are so capacious that they are capable of holding several times the entire volume of the blood.[1] These facts have caused physiologists to regard the splanchnic vessels as the great reservoir for the control of the circulation. Operations which involve direct interference with this reservoir may cause circulatory disturbances of a grave character. It is the purpose of this paper to call attention to the causes of such disturbances and to suggest means for preventing their occurrence.

The anatomical arrangement of the abdominal vessels, presents three points of special singificance:

1. The circulation through the abdominal viscera is through two sets of capillaries, separated by the portal vein and its radicles. This must slow down the rate of the circulation through the abdominal organs. It is well known that the pressure in the vessels of the liver is very low.

2. The veins of the abdomen have walls so thin that they are easily compressed by the slightest pressure upon them.

3. None of the abdominal veins have valves. How is the flow of the blood through the abdominal organs maintained?

We can think of four forces which are involved: These are the force of the heart, the negative pressure of the thorax, the movements of the muscles surrounding the abdominal cavity, and as suggested by Mall,[2] the peristaltic movements of the alimentary canal. It is certain that the force of the heart drives the blood as far as the first set of capillaries. Does it assist the flow beyond this point, or is the flow from here back to the thorax maintained wholly or in part by the other forces?

The key to this problem, it seems to us, is furnished by the behavior of the abdominal circulation when the intra-abdominal pressure is markedly elevated. It has long been a clinical puzzle why patients with peritoneal effusions under great pressure (as high in some cases as 50 or 60 millimeters of mercury) show so little disturbance of the general circulation. It would seem that such a pressure would compress the thin-walled vena cava and other abdominal veins and prevent any flow through them, yet these patients may have no disturbance of circulation in the legs and no abnormal elevation of general blood-pressure.

In a series of experiments carried out on dogs, we took simultaneous tracings of the intrathoracic pressure, of the intra-abdominal pressure, of the pressure in the inferior vena cava, and of the general blood-pressure. The pressure in the vena cava was taken by thrusting a canula up through an opening in the femoral vein. We raised the intra-abdominal pressure by injecting warm salt solution into the peritoneal cavity.

The tracing (Fig. 1) shows that the intra-abdominal pressure and the pressure in the inferior vena cava are always equal and rise and fall together. When the intra-abdominal pressure is elevated till it is higher than the blood-pressure, the circulation through the abdomen is abolished, the abdominal viscera being found bloodless at autopsy.

What is the explanation of these findings? Suppose that the intra-abdominal pressure be increased above the venous pressure. The veins will be compressed and no blood will flow through them till enough blood has been forced into them from the arteries to raise the intravenous pressure to the level of the intra-abdominal pressure.

Our experiments have driven us to the conclusion that the chief and essential force which propels the blood through abdominal organs is the beat of the heart. The well-known fact that pressure upon the abdomen increases the output from the inferior vena cava is not evidence against this view, because such increase is not maintained unless the circulation is greatly depressed. The absence of valves in the abdominal veins prevents any variations in intra-abdominal pressure due to movements of the abdominal walls from pumping the blood toward the thorax with any great degree of efficiency, because as soon as the pressure is released there is a regurgitation. That the heart alone is capable of keeping up the abdominal circulation is proved by the experiment we have described. For in this the abdomen was distended till all movements of its walls and of the diaphragm had ceased, and till the intrathoracic pressure was positive most of the time, yet the circulation through the abdomen was maintained. In such a case no force other than the beat of the heart could be in action. The design of nature in not providing the abdominal veins with valves would seem to be to prevent the forcing too suddenly of a dangerously large amount of blood into the thorax.

The action of venous valves and the mechanism by means of which the circulation through the legs is maintained, we showed by the following experiment: Having divided the femoral vein of a dog, we tied the proximal end and attached a manometer to the distal end. At the same time we recorded the blood-pressure in the carotid

artery. The pressure in the femoral vein rose to the exact level of the blood-pressure. When we squeezed the paw, this pressure arose to a height several times greater than the blood-pressure (Fig. 2). This experiment clearly shows (1) that the *vis-a-tergo* of the heart unaided can raise the venous pressure to the level of the arterial pressure, and (2) that the valves in the veins of the leg form a device by means of which every movement of the limb which compresses the veins suffices to force blood into the abdomen. No matter how great the intra-abdominal pressure may be, we would not expect venous stasis to occur in the legs, so long as the venous valves are competent, provided there is no cardiac nor renal disease. This conclusion, as far as we can determine, is in accord with clinical obsevations.

Since the splanchnic vessels are capable of holding several times the total amount of blood in the body, it is evident that something must prevent their complete filling. We know of two mechanisms for preventing this. These are the vasomotor apparatus and the contraction of the abdominal muscles. The first acts by decreasing the flow into the splanchnic area, and the second by raising the abdominal pressure, thereby diminishing the capacity of the capillary and venous channels.

The relative importance of these agencies can be determined by deduction from the facts we know about the mechanical conditions of the abdominal circulation, and by direct experiment. The argument from deduction is as follows:

Since the abdominal veins are never filled to more than a part of their capacity, they must be held in a condition of partial collapse by the intra-abdominal pressure. The blood in them, as we have demonstrated, is under this pressure. The flow through them depends upon the *vis-a-tergo* of the heart, assisted somewhat by the negative

pressure in the thorax, and by rythmical variations in the intra-abdominal pressure. If, now, the latter be reduced to that of the atmosphere by weakness or paralysis of the abdominal walls or by laparotomy, the force of the heart will continue to propel blood into the veins, but there will be no force in action to drive it out of them till they are distended to their full capacity, because their walls no longer have any external support. But since there is not enough blood in the entire body to distend them to this extent, nearly all the blood will accumulate in the abdomen. It would seem that such an accumulation can be retarded, but not entirely prevented by contraction of the splanchnic arterioles, since it is improbable that such contraction can be so effective as to shut off all flow through these vessels. Under the conditions we are considering, death will soon occur unless the return of blood from the abdomen be assisted by gravity or by pressure upon the abdomen.

That these theoretical deductions are correct is shown by much direct experimental evidence. It is well known that a hutch rabbit soon dies when held up by its ears.[3] The cause of death has been shown to be the accumulation of blood in its abdomen. Its thin abdominal muscles are too weak to maintain an adequate intra-abdominal pressure. The wild rabbit cannot be killed in this way. A dog when etherized till its muscles are completely relaxed will die in the head-up posture, while it will be little affected by the same if unetherized or etherized lightly. The fatal outcome in cases of this kind can be retarded but not prevented by contraction of the abdominal arterioles. It can be delayed but not prevented by stimulation of the splanchnic nerves, and it is hastened by section of these nerves. Figs. 3, 4, and 5 show the effect upon blood-pressure of the head-up posture under different degrees of intra-abdominal tension.

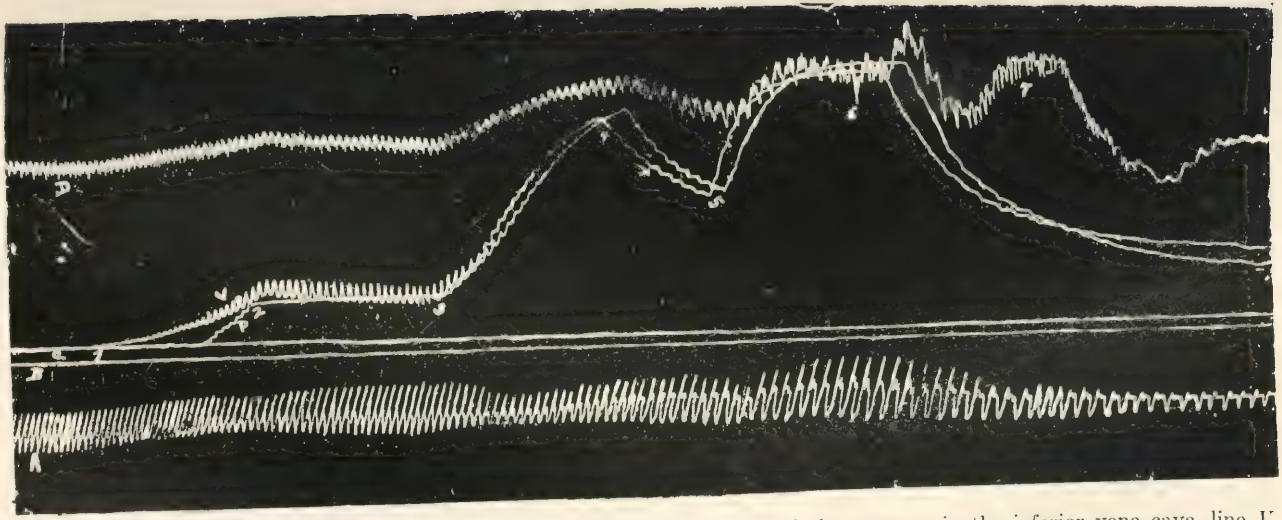

FIG. 1.—Tracing showing that the intra-abdominal pressure, line *P*, and the pressure in the inferior vena cava, line *V*, are equal. *C*, base line for abdominal pressure and venous pressure. *D*, arterial blood-pressure measured by carotid. The markers which recorded lines *V* and *P* had to be placed at slightly different horizontal positions to avoid their collision. Note the correspondence of the two curves except at their highest points, where the curve *P* is slightly higher than curve *V*, due to the fact that here the intra-abdominal pressure is as great as the general blood-pressure and the circulation through the abdomen is failing. In records showing an increase in intra-abdominal pressure to a level slightly below that of the arterial pressure the latter does not rise above its normal level.

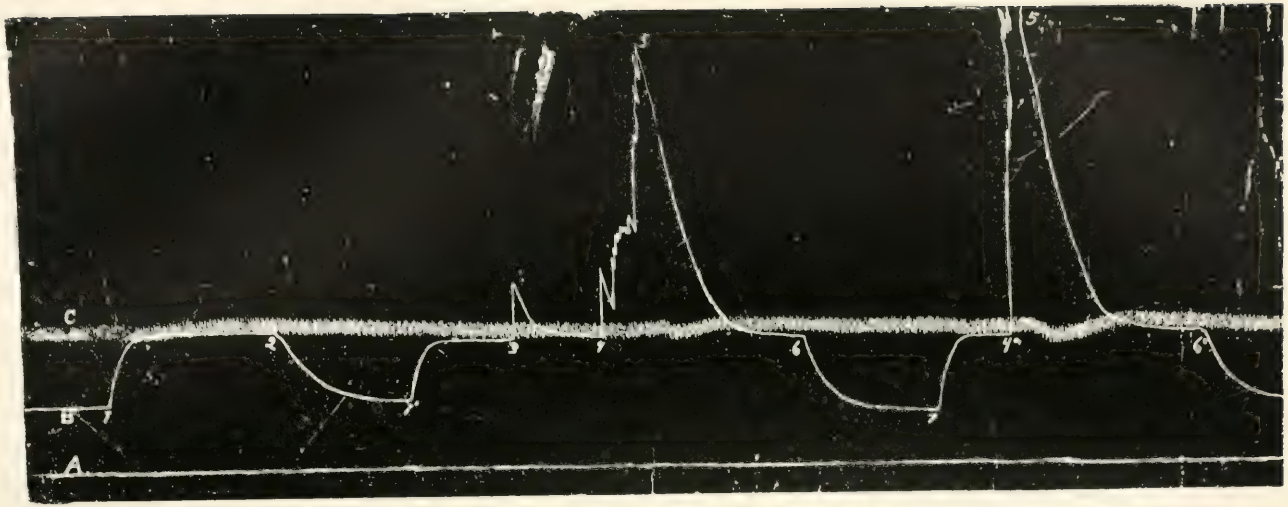

FIG. 2.—Tracing of the carotid blood-pressure and of the pressure in the distal end of a severed femoral vein. *A* is the base line; *B* is the end pressure in the femoral vein; *C* is the carotid blood-pressure. The femoral artery was clamped at the beginning of the experiment; at 1 the clamp was removed; note that the venous pressure immediately rises to the level of the arterial pressure. At 2 the artery was clamped again, causing a gradual fall of pressure in the vein. At 1 the artery was again unclamped. At 3 and 4 the paw was squeezed but not very strongly either time. At 5 the pressure on the paw was released.

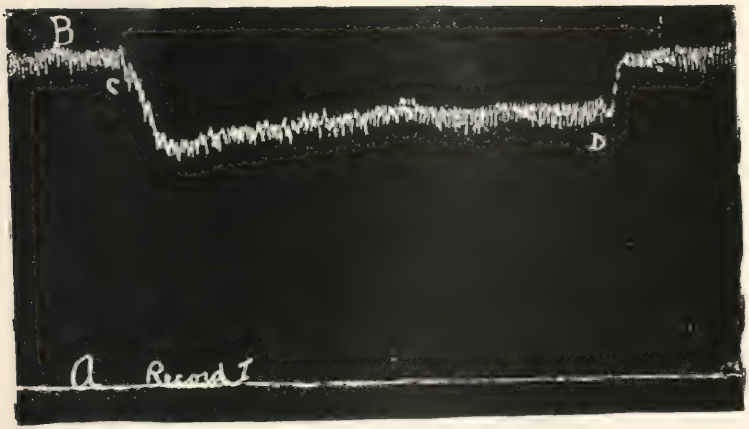

FIG. 3.—Tracing showing the effect upon blood-pressure of the head-up position under ether anesthesia, light enough to preserve a slight degree of tension of the abdominal wall. *A* is the base line, *B* the blood-pressure; at *C* the dog was placed in the head-up position of 60 degrees; at *D* it was placed in the horizontal position. Note the moderate fall of blood-pressure and the partial compensation between *C* and *D*.

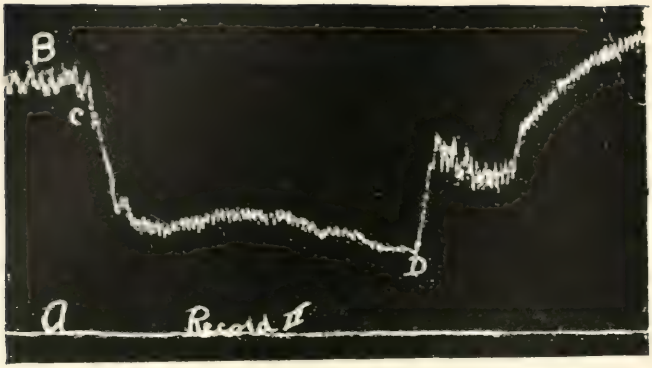

FIG. 4.—Tracing showing the effect upon blood-pressure of the head-up position when complete muscular relaxation had been produced by curare. Dog under artificial respiration. The letters have the same significance as in Fig. 3. Note the sharp fall of pressure at *C*, and the progressive fall between *C* and *D*.

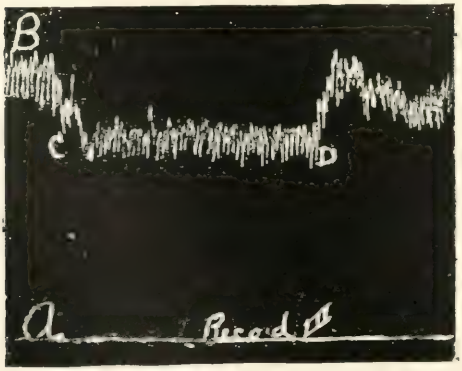

FIG. 5.—Tracing obtained from a dog paralyzed by curare, into the abdomen of which warm normal salt solution had been injected till the abdominal walls were under slight tension. Lettering the same as in the last two figures. This tracing shows clearly that the fall in blood-pressure in the curarized animal, due to the head-up position, can be prevented in great part by raising the intra-abdominal pressure.

We conclude that life is possible when the intra-abdominal pressure has been reduced to that of the atmosphere, only when the return of blood to the heart is assisted by gravity, and when the animal is not required to make any great exertion. It is a fallacy to think that pressure upon the abdomen in cases of failure of the circulation owes its beneficial effect to compression of the arterioles and support of the vasoconstrictor mechanism. Raising the intra-abdominal pressure may perhaps render some support to the vasoconstrictor apparatus, but its chief beneficial effect is due to the partial obliteration of the veins and capillary vessels.

Let us now consider the application of the principles we have just discussed to the question of the effect of laparotomy. Theoretically it may seem that the chief danger of opening the peritoneal cavity arises from the decrease of the intra-abdominal pressure. But in case the incision is not a very large one and the intestines are not allowed to protrude, the opening, as we have shown by direct experiment, does not affect this pressure to a marked degree. However, if the viscera are pulled out and freely exposed the pressure becomes atmospheric and there is a marked stasis of blood in the abdominal veins, which withdraws a dangerously large amount of fluid from the circulation. Direct pressure by means of large pads upon the exposed viscera is sufficient to correct this trouble, and we advocate that it be employed continuously during evisceration. This means is capable of supplying the place of the normal intra-abdominal pressure. In fact it is so effective a means of returning blood to the heart that it may be, at times, a source of danger, as we have pointed out in a former article.[4]

The effect of anesthesia, so deep as to abolish completely the tone of the abdominal wall, is to promote the accumulation of blood in the abdomen and limbs, and in our opinion,

not uncommonly causes a failure of the circulation during and after operation. It is fortunate that laparotomy is nearly always performed with the patient either in the horizontal or in the Trendelenburg position, for if it were usually done with the patient deeply anesthetized and in the feet-down posture many more fatalities would occur. Operations both on animals and on man are much better borne under an anesthesia so light as to preserve the tone of the muscles. This is one reason why there is much less so-called "shock" under nitrous oxid oxygen anesthesia than under anesthesia due to more powerful agents.

In performing exploratory laparotomy for gunshot wounds of the abdomen, we have several times noted, on opening the abdomen, what we felt certain was a great increase in the hemorrhage from a severed intra-abdominal vein. In one case in which the bullet had wounded the vena cava, there was but little blood found when the abdomen was first opened, but when we raised the transverse colon a frightful gush of blood took place. We have made similar observations in two cases of gunshot wounds of the liver. On theoretical grounds we would expect the hemorrhage from such as source to be increased by laparotomy, for with the abdomen intact the pressures in the vein and that in the peritoneal cavity are equal and but little blood will flow, therefore, from the vein. However, when the peritoneal pressure has suddenly been reduced by laparotomy below that in the vein, active bleeding will occur.

It is well known that patients with large umbilical herniæ are liable to sudden death after operation. It has been suggested by Judd,[5] that the chief cause of this is the sudden increase in the intra-abdominal pressure due to the reduction of the hernia and the closure of the defect in the abdominal wall. He does not give his opinion how such increase in abdominal pressure acts to bring about this fatal result. We are inclined to attribute it to impeded

respiration, rather than to direct embarrassment of the circulation, because elevation of the intra-abdominal pressure, even to a great height, does not, in the absence of asphyxia, cause any noteworthy increase in the general blood-pressure.

We shall consider next the effect upon the circulation of exposure and traumatization of the abdominal viscera. The nature of these effects is shown to every surgeon. Exposure of the intestine to the air causes it to become intensely congested and blue in color. After somewhat prolonged exposure and handling it becomes edematous, and subperitoneal extravasations of blood occur. Microscopic sections of exposed gut or omentum show all the changes characteristic of acute inflammation—in fact some of the classical descriptions of inflammation were derived from such material. There is intense congestion and actual thrombosis of the veins, with margination of leukocytes, edema of the tissues and large and numerous extravasations of blood. When we take into account that the peritoneum has a surface as large as the entire cutaneous surface of the body we can form some conception of the amount of plasma and blood-cells which may be withdrawn from the circulation by such changes.

The work of Crile in developing the vasomotor theory of shock has been of immense service to surgery, has stimulated the performance of a great amount of clinical and experimental work, and has led to numerous improvements in operative technique and anesthesia, but the results of Janeway, Seelig and Lyon,[6] Henderson,[7] Mann,[8] and others, have made it no longer tenable.

In an extensive experimental investigation of surgical shock, carried out in the writer's laboratory by Doctor Frank Mann, it was found that unless the abdomen be opened it is impossible to reduce a dog to a condition of shock by traumatization alone, if the anesthesia be care-

fully attended to, and if all hemorrhage be prevented. Severe traumatization alone, without laparotomy, carried out for periods of four to six hours' duration has no injurious effects upon the animal's circulation or respiration. This statement is in accord with the findings of Porter,[9] Hill, and others, and is, we believe, also in accord with every-day observation in human surgery. We must conclude that the harmful effects of nervous stimuli from the field of operation upon the nervous centers during general anesthesia are almost *nil*. The anesthesia blocks the passage of afferent impulses to the motor cells, and the activity of the vital centres is then controlled, almost entirely by the chemical constituents of the blood.

Mann, after a careful review of the protocols of the experiments of various investigators of shock, could find but few experiments described in which, if the method of producing shock were recorded at all, laparotomy and traumatization of the viscera were not the means employed. The experiments of Henderson, who produced shock by excessive pulmonary ventilation, are an exception to this statement. Mann arrived at the conclusion that experimental surgical shock is caused practically always by the accumulation of blood in the abdominal viscera. Such accumulation may be brought about by deep anesthesia alone, especially when the same is associated with the head-up posture. The explanation of this we have already given. Shock of this character is quite easily recovered from because the plasma and blood-cells are still in the vessels, and need only to be forced into the general current of the circulation to bring the patient around. When, however, the viscera have been exposed and traumatized, the fluid and cellular elements of the blood pass outside the vessels, there being a grave injury to the endothelial cells of the smaller channels. Recovery is then more doubtful and its possibility depends upon the amount of blood

which has been lost. Seelig and Lyon, Malcolm,[10] Mann, and others, have produced what seems to us conclusive evidence that the visceral and peripheral arterioles are constricted in shock, and that the vasomotor centre is active till the very end. The blood-pressure falls, to be sure, but this is because there is not enough fluid in circulation to maintain it, and happens in spite of the vasoconstriction.

The remarkable experiments of Carrel,[11] with what he terms visceral organisms, have an interesting bearing upn the questions we are considering. In these experiments Carrel removed all the thoracic and abdominal organs from cats and dogs and preserved them at 38° C. in Ringer solution, being careful to prevent any loss of blood and keeping up intratracheal insufflation all the while. The heart continued to beat, but the organs would generally soon become pale and anemic looking. By transfusing blood from a living animal, however, into the organism, the latter would assume a normal color, and the circulation would be completely restored. Carrel succeeded in keeping such organisms alive for from twelve to thirteen hours, and found that the digestion of food, excretion of urine, etc., were carried out by them in a fairly normal manner. He states that after five or six hours, hyperemia of the intestines and peritonitis usually developed, and it appears from his account that this was the cause of death of the organism.

We believe that the following interpretation of the circulatory phenomena observed in these organisms is justified. When the vasomotor tone of the splanchnic arteries is abolished by severance of all connection with the central nervous system, the blood drains rapidly into the capillary and venous channels of the viscera and so much blood accumulates in these that the circulation fails. When they are completely filled by transfusion it is restored,

but fails again when inflammatory changes in the intestines permit the exudation of plasma and cellular elements from the vessels. The circulation of a patient reduced to shock by exposure and traumatization of his abdominal organs is in practically the same condition as that of one of these organisms after the peritonitis has developed, for in both cases there is (1) a vasomotor paralysis of the great splanchnic vascular area produced in the case of the patient by the traumatic peritonitis, and in that of the organism by loss of connection with the central nervous system plus the peritonitis; (2) a loss of external pressure capable of keeping the veins and capillaries compressed, and (3) an active loss of plasma and blood-cells due to damage of the endothelial walls of the vessels.

The phenomena of shock and of hemorrhage are practically identical, the only essential difference being that in shock there is a marked fall in the leukocyte count. This is to be accounted for on the evidence of microscopic sections of the exposed and traumatized abdominal organs, by the accumulation of leukocytes in the exposed viscera. Dolley,[12] states that the changes produced by hemorrhage and shock in the cells of the central nervous system are identical.

The conception of the nature of shock which we have just outlined may be termed conveniently the peripheral theory. It will make us combat the occurrence of shock by measures calculated to prevent the accumulation of blood on the venous side of the circulation, especially in the abdomen. In laparotomy there are three chief things to be attended to: (1) the anesthesia, (2) the posture of the patient, (3) the operative procedure.

1. With regard to the anesthesia, the depth, from our present stand-point, is the most important thing to consider. The opinion that deep anesthesia is beneficial is a fallacy. Deep anesthesia is to be avoided because it

promotes stagnation of blood in the veins. The ideal depth of anesthesia is that at which the troublesome reflexes of vomiting and struggling are abolished, but at which the tonus of the muscles is well preserved. In observations on over a hundred animals and on several thousand human subjects we have never observed any harmful reflex disturbance of either respiration or circulation to occur at this depth of anesthesia. Small variations in blood-pressure may result from traumatic stimuli, but they are in no sense harmful and are not nearly so large as occur almost every moment of waking life. Struggling, vomiting and asphyxia must be avoided.

2. We have pointed out in a former paper certain dangers of the Trendelenburg position. The practical conclusion therein arrived at is that this position should not be used in the presence of cyanosis or struggling, and that it should be used with caution in case the heart is diseased. With these exceptions we believe the position to be harmless. It is distinctly beneficial in shock.

3. The peripheral theory of shock does not compel us to employ short abdominal incisions for fear of lowering the intra-abdominal pressure. It rather, in fact, makes us use longer incisions, for if we keep the viscera inside the abdomen, the intra-abdominal pressure is kept at a level sufficiently high for safety, and less trauma will be done with the long than with the short incision. The theory does compel us to avoid evisceration, and if this is necessary to keep constant pressure on the intestines removed. It is needless to dwell upon the necessity of gentle handling of tissues, keeping the intestines covered, etc.

We have seen the intestines packed off with wet pads steaming hot, which were kept at this temperature by frequent wetting with hot salt solution. Experimentally animals may be reduced to a state of shock by this means alone. At autopsy extensive edema of the parts exposed

to heat are found and the veins are full of thick tarry blood. It is well known that a rabbit may be killed by immersing only its ears for some time in hot water. The condition so produced by heat seems to be due to a decomposition of the plasma, whereby toxic proteid substances are freed, as is probably the case in burns of the skin.

When the grave inflammatory changes which we have described have taken place over large areas of peritoneum, the treatment of the condition becomes the same as for hemorrhage. Abdominal compression which may be conveniently accomplished by binding a pillow tightly to the abdomen is a valuable measure, since it prevents further loss of blood from the general circulation. It is powerless to restore to the circulation the plasma and blood-cells already in the tissues. Direct transfusion of blood, if possible, is the most efficient remedy.

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RECENT EXPERIMENTS DEFINING THE DANGERS OF ANESTHESIA

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(By Invitation)

The past five years have probably contributed more to precise knowledge of anesthetics, their practical use and the real nature of their dangers, than the preceding thirty. For many years there had been almost a condition of stagnation in this field. There were indeed investigations, for example those of the Hyderabad Commission on the dangers of chloroform—a commission which, by the way, overlooked the essential point and reached a wrong conclusion. But such investigations were to a great extent merely a rattling of dry bones. There was little that was new in technique of administration, and less that was suggestive for the opening of new fields of observation and experiment.

The conceptions of the dangers of anesthesia were simple and unquestioned. The expressions "failure of respiration" and "failure of the heart" summed up everything. Each was a single definite process, although a few particularly broad-minded persons recognized also a "vasomotor failure." In both, or in all three, of these supposed modes of death the cause of trouble was assumed to be nothing else than excessive anesthetic or some vaguely guessed-at weakness in the patient.

I cannot better express the renewed vitality of investi-

gation in the field of anesthetics than by illustrating it with some of the recent important contributions. I shall take first the work of A. Goodman Levy,[1] done in Professor Cushny's laboratory at University College, London. As you are aware, the Hyderabad Commission reached the conclusion that if the administration of chloroform be pushed it will happen "999,999 times out of 1,000,000, that respiration will fail before the heart." This amounted to saying that the fatalities under chloroform were mere carelessness on the part of the anesthetists. Naturally the practical anesthetists who had seen patients not only breathing at the moment the pulse disappeared, but even breathing vigorously for a minute or more thereafter, refused to accept such a statement.

The mistake lay in the assumption that fatalities under anesthesia must be due to excess of the anesthetic. This is an error which it seems extremely difficult to overcome in the minds of surgeons. They are prone to insist that "if that fool anesthestist had not poured on too much ether (or chloroform, as the case may be) we should not have had all that trouble." Anesthestists, on the contrary, are usually quite ready to recognize the fallacy, for they know as well as anyone can who has only a very inexact method of measuring dosage that trouble often comes when less rather than more has been given.

Levy's work has shown that primary heart failure under chloroform is a perfectly definite and easily induced result of very definite conditions. He quotes cases from the literature showing that one of the essential conditions of such fatalities is *light* chloroform anesthesia. Such mischances do not occur under deep chloroform anesthesia, for the heart is then merely depressed, and as respiration always fails first it is usually easy to effect resuscitation.

Most of the fatalities quoted by Levy occurred either

[1] Heart, 1913, iv, 319.

during the initiation or termination of anesthesia. They involved beside the light anesthesia another factor, namely, excitement, strong sensory stimulation, or an injection of adrenalin. A man was having the septum of his nose straightened. He was in excellent condition under very light anesthesia. Some adrenalin was injected and he promptly died. A girl had passed through an operation in excellent condition and the administration of chloroform had been discontinued. As she had a stiff knee the surgeon forcibly flexed it. She gave a little cry and died. A man was given an insufficient amount of chloroform, so that the stage of excitement was prolonged; finally enough was given to induce a moderate depth of anesthesia, and he suddenly became pale and pulseless. In nearly all of these and similar cases respiration continued and was even abnormally vigorous after the pulse disappeared.

These are types of cases which Levy has shown are easily reproducible on animals, particularly cats. I have myself seen many such fatalities unintentionally produced in animals by timid anesthetists. I have also repeated with entire success Levy's primary experiment in which adrenalin is administered to a cat lightly chloroformed, and have obtained exactly the same sudden heart failure and complete and irrecoverable fall of arterial pressure which Levy's experiments show.

What is it that occurs in these cases? Levy has shown by an almost excessive thoroughness of experimental demonstration that it is a condition of fibrillation of the ventricles—delirium cordis—a condition which, unlike mere cardiac inhibition or vagus or asphyxial standstill, is in as large an animal as man, in the majority of cases, practically irrecoverable.

I have tried experiments to see whether similar deaths could be produced in cats by means of adrenalin or sensory stimulation or prolonged excitement under light ether

anesthesia. A certain degree of the cardiac irregularity, which is a condition precedent to delirium cordis, is thus producible, but I have never obtained a complete and fatal fibrillation of the heart by this means.

Another of the modes of fatality which is now under analysis is one occurring under ether. Cathcart and Clark[1] find that under light etherization the heart in rabbits is markedly depressed by a degree of asphyxiation which is quite harmless under full anesthesia. Exactly what this effect consists in, and how far it applies to human cases, we must await further investigations to learn. I have mentioned the observation here because, like the work of Levy, it bears out a point which was particularly emphasized in the report of the Committee on Anesthesia[2] of the American Medical Association a couple of years ago—a committee of which I was chairman—in which the point was specially emphasized that few anesthetic fatalities are due merely or mainly to excess of anesthetic. As a rule they result more or less directly from incomplete anesthesia and the stage of excitement. I may here repeat also another point made in that report, namely, that in view of what we now know of the dangers of postoperative chloroform poisoning and of the not infrequent toxic effects on mother and child when chloroform is used in labor, it is about time that the use of chloroform should be given up altogether.

I wish to return now to the subject of partial asphyxia under light ether anesthesia. Not very long ago I had occasion to observe a difficult subject under ether. For the most part it was administered by what is called an "open" method—although why the term "open" should be applied to the type of mask employed I am unable to see, for the patient became at times markedly cyanosed. Part of the time a frankly rebreathing method of mask and Rovsing

[1] Journal of Physiology, 1913, xlvii, 393.
[2] Jour. Amer. Med. Assoc., 1912, lx, 1908.

bag was used, and when too closely applied some degree of cyanosis was observed. From the Rovsing bag I obtained gas samples which were afterward analyzed for ether, CO_2, and oxygen. The figures obtained are shortly to be published by Dr. John Bryant, for whom I made the analyses. I may mention here, however, that throughout the series of analyses the oxygen content of the air in the bag and the patient's color showed the closest correspondence. Low oxygen in the inspired air occurred with cyanosis, and a fair amount of oxygen with a good pink color. It seems to me altogether probable that if analyses had been made of air from the open mask the same correspondence would have been proved. If so, this mask was really far from open, for when the patient became rigid not only was ether poured on in a steady stream, but the mask was also pressed down on the face until marked cyanosis occurred. The Rovsing mask and bag seemed to keep the patient a better color, in spite of the difficulties of the case, as well as to afford a better control of conditions, than did the open drop method with which it was alternated.

From such observations I have become very skeptical regarding the distinction between open and closed methods. The so-called open method is often far from open. There is in the cone a very considerable dead space from which the patient rebreathes, and at times there appears to be (and this is much worse) a considerable mechanical obstruction to the movements of air. The "open" method as applied to ether is a very crude and unscientific procedure. In the first place, more than half of the ether is volatilized during expiration and blown off into the room. That is one of the reasons why, when a refractory patient develops stormy breathing, the anesthetist is compelled to pour on such a volume. Boothby[1] has recently demonstrated that

[1] Journal of Pharmacology and Experimental Therapeutics, 1914, v. 379.

the amount of ether in the inspired air necessary to produce and maintain anesthesia is exactly the same in all subjects no matter whether refractory or otherwise. It is time that we recognized that although ether is for the anesthetist a liquid, it is for the patient just as distinctly a gas as is nitrous oxide. The time is close at hand, in my opinion, when in every well-ordered and scientific operating room, where ether is used at all, instead of its being poured as a liquid over the patient's face and into his mouth, there will be a device—and it can be a very simple device—on a stand at the anesthetist's elbow, or over in the corner, or possibly even down in the basement, in which the ether will be volatilized and from which it will be conducted to the patient's nose and mouth, as if it were merely an unusually strong variety of nitrous oxide. That this idea is rapidly gaining recognition and acceptance is evidenced by the insufflation method of Meltzer, the simple and accurate device of my colleague, Dr. J. M. Flint, and most recently by the anesthetometer of Connell.

It is at once a simpler, safer, and more scientific procedure to administer the gas which we call ether vapor than it is to handle liquid ether. In some observations on myself and others in my loboratory we merely put 5 c.c. of ether into a bottle and blow air through the bottle by means of a bellows or rotary air blower into a large bag of a capacity of 20 liters. This gives an air ether mixture of about 5.7 per cent. by volume, a little less than the amount needed, according to Boothby, to maintain surgical anesthesia. In our experiments after obtaining preliminary records, we administered this air-ether mixture to each other by means of a mask and pipe precisely as if it were nitrous oxide. We continued the administration several times to the point of unconsciousness. To all of the subjects of these experiments it was a surprise to find that ether taken in this way, provided it is the best quality of ether, is not appreciably

more unpleasant than nitrous oxide. And nitrous oxide is for me rather enjoyable.

The particular object of these experiments was to determine whether there is in reality such a difference in different samples of ether as some practical anesthetists believe. It has long seemed to me that if there is such a difference it must consist very largely in different degrees of intensity in exciting respiration. Some years ago I showed that in dogs one can administer ether so badly as to maintain for twenty or thirty minutes at a time a very excessive respiration, and that thereafter they were prone to a failure of the breathing, which without measures of resuscitation frequently proved fatal. Recently Meyer[1] working with Dr. J. S. Haldane, has confirmed on man my claims regarding the effects of pain and of ether in exciting hyperpnea. I may perhaps remind you that one of the great advances in physiology during the past few years, especially as the result of the experiments of Haldane and of those who have worked under his inspiration, has been the proof that ordinarily the breathing is controlled not by oxygen needs but by the CO_2 putput, that there is a large reserve of CO_2 stored in the body, and that if the breathing is abnormally excited and this store considerable reduced, there is certain to follow a compensatory period, a reaccumulation, during which respiration is subnormal to the point of cyanosis and partial asphyxia, or in which the breathing even fails altogether. Thus, in my experiments comparing different samples of ether, the points noted were both the degree of hyperpnea during a brief period of administration, and also the intensity and duration of the period of subnormal breathing which followed.

Briefly stated, it was found that with a grade of ether such as we buy for ordinary laboratory use in tanks of several gallons there was a marked augmentation of breath-

[1] Journal of Physiology, 1914, xlviii, 47.

ing in one subject and a fairly active hyperpnea in another. With the best grade of ether, such as comes in small sealed cans, the excitant effects were comparatively slight, while the same ether after being kept for two months, with the addition of a few cubic centimeters of water, a ready access of air through a loose cork, and standing in a place exposed to the sunlight, gave very marked hyperpnea in a sensitive subject and a considerable augmentation of breathing in insensitive subjects. Particular attention should be called to the fact that whenever hyperpnea was induced it was followed by exactly such a period of subnormal breathing, Cheyne-Stokes respiration, and apnea interrupted by deep gasps as is the well-recognized result of acapnia, that is, diminished CO_2, consequent on excessive respiration.

Such a condition of insufficient breathing is an extremely common consequence of etherization. It adds the evil influence of a more or less prolonged period of insufficient oxygen supply to the other conditions, lowering the patient's vitality. It is clear that the logical procedure to prevent this is some method of administering ether vapor such as Dr. Gatch showed to be so advantageous with nitrous oxide, and also some method of administering a sufficient amount of CO_2 in the air breathed after the anesthesia is ended to stimulate respiration to a more rapid elimination of the ether with which the body is saturated, and to prevent apnea or subnormal breathing, anoxemia, and cyanosis.

NERVE-BLOCKING

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Chicago, Illinois

(By Invitation)

It has been the aim of surgeons from time immemorial to render painless surgical operations. While the early attempts undoubtedly mitigated somewhat the pain of operation, success in this line cannot be said to have been achieved until the advent of ether and chloroform. The use of these agents produces an abolition of consciousness, and during this state no pain is perceived. For years after the discovery of these and other general anesthetics the abolition of consciousness was considered essential to complete freedom from pain during operations, but following an article by Koller in 1884 on the anesthetizing effect of cocain when applied to the mucous membrane of the eye, much experimentation was done in order to determine the practical value of cocain when applied locally to mucous membranes, or when injected subcutaneously, in producing local anesthesia so that the part could be operated on without pain. It was found that cocain when applied to a mucous membrane would produce practically complete anesthesia, although somewhat superficial in character, and that when injected subcutaneously an area of anesthesia would be produced varying in duration and extent, depending upon the strength of the solution used. The very high toxicity of cocain made the subcutaneous use of this drug for its local anesthetizing effect so dangerous as to limit the practical

applicability of the method to comparatively slight operations, and after enjoying a rather brief period of favor the method fell into disuse, except in certain cases.

It was observed very early that if the cocain solution were injected in close proximity to a sensory nerve trunk that the area of anesthesia was not limited to the region injected, but extended to the entire region supplied by the nerve with which the solution had come in contact. It seems but little use was made of this principle at the time, but shortly thereafter the anesthetizing effect of cocain when injected into the central spinal canal was brought forward and spinal anesthesia became quite popular; but its high mortality soon put a check to its general adoption.

The possibility, however, of producing anesthesia sufficiently for surgical purposes without the abolition of consciousness was demonstrated, and the desirability of the method, together with its great advantages, provided it could be freed from the dangers due to the toxicity of the substances used at once became apparent.

The search for something less toxic than cocain led to the discovery of a number of substances which, when applied locally, produce anesthesia. Among these may be mentioned the various forms of eucain, tropocain, stovain, alypin, orthoform, cycloform, novocain, etc. None of these substances possess anesthetizing properties to the same high degree as does cocain, but they are all less toxic than cocain. Of these substances novocain seems to be the best as it possesses a comparatively low toxic coefficient combined with high anesthetizing properties. It is also readily soluble in water and will stand a reasonable amount of boiling without decomposition.

While experiments show that novocain is only about one-seventh as toxic as cocain, it should not be forgotten that serious and even fatal results may follow an overdose. The amount of novocain that can be injected without producing

toxic symptoms varies considerably and depends largely upon the rapidity of absorption. If a plain watery solution be used and injected in a region where absorption is rapid 0.3 gm. to 0.4 gm. may produce symptoms; but if the solution be one which absorbs slowly 0.5 gm. to 1 gm. may be used without danger. The more rapid the absorption the less marked the anesthesia, for it requires a certain length of time for the drug to act. The addition of adrenalin to the solution materially increases the degree and duration of the anesthesia. Hoffmann has found that the addition of 0.25 to 1 per cent. of potassium sulphate also materially increases the duration of the anesthesia, and that he was able to produce anesthesia with a much weaker solution.

I have found in my own work that by the addition of calcium chloride in varying strengths the anesthesia may be prolonged to two or three hours without difficulty, and that a weaker solution may be used than without the calcium chloride. The formula which I am using at present and which has given me the best results is novocain, 0.25 to 1 per cent.; calcium chloride, 0.25 to 0.5 per cent.; chlorbutanol, 0.8 per cent. in distilled water, to which are added 4 to 5 drops of the 1 to 1000 adrenalin solution to 30 c.c. of the mixture. It is very essential that the mixture be properly prepared and the method which I use is as follows: The distilled water is sterilized by boiling. The novocain is then added and the boiling continued not to exceed two or three minutes, as prolonged boiling spoils novocain. When this has cooled down to below 160° F. 1 gr. of chlorbutanol is added to every 100 c.c. of the novocain solution. Water dissolves only about 0.8 per cent. of chlorbutanol, but 1 per cent. is added merely as an easy way of insuring a saturated solution. The undissolved part simply settles at the bottom. A 2 per cent. to 4 per cent. solution of calcium chloride in distilled water is made and sterilized, and then the chlorbutanol added the same as to

the novocain solution. The solutions are kept separately and mixed just before using. In this way the percentages of the ingredients may be quickly varied to suit the particular case. The adrenalin should never be added until just before using, as it is very unstable and soon spoils if left standing in the solution, which is indicated by the solution gradually turning a reddish color. The adrenalin solution should be comparatively fresh, and if it has turned reddish in color it should not be used. The chlorbutanol is added because it has distinct anesthetizing properties of its own, and being soluble in lipoids, increases the anesthetizing effect of the novocain.

If this solution be brought in contact with a nerve it penetrates the nerve and interrupts or blocks the passage of nerve impulses at that point. If the nerve be a mixed one, afferent impulses are blocked before efferent. If the blocking is complete no afferent impulses can travel along the nerve at the point of blocking, hence no sensations having their origin in the region supplied by the nerve blocked can be perceived. Sensations are of several kinds: touch, pain, temperature, pressure, etc. When a nerve is blocked these are not all lost at the same time. Pain is lost first and pressure last. The prick of a pin may be recognized after it ceases to be at all painful, and pressure can usually be recognized after touch is lost.

On making an incision through the abdominal wall, for example, it is found, as might be expected, that the skin is the most sensitive. The subcutaneous fat is but slightly sensitive while the muscle and parietal peritoneum are quite sensitive. I have observed several times that the patient would complain of feeling the cutting of the muscle when absolutely nothing was felt when the skin or peritoneum was cut. The complete absence of muscular rigidity and of increased abdominal tension is a certain indication that the peritoneum, where it is being handled, is anesthetized.

When the abdomen is opened under a circumscribed blocking it is very interesting to rub or draw on the parietal peritoneum outside of the blocked area and to note the character and location of the sensations described by the patient. For instance, if the lateral parietal peritoneum be drawn on, as may be done usually, when there are adhesions between the colon and the lateral wall, the patient at once complains of a pain in the side; rubbing the peritoneum over the bladder, or of the lower abdominal wall, causes a sensation in the bladder with the desire to urinate; rubbing the peritoneum of the cul-de-sac of Douglas is referred to the rectum.

The uterus and ovaries are not particularly sensitive when touched, but if the infundibulopelvic or the broad ligament be drawn on, pain is produced which is referred to the lateral wall of the pelvis. Handling or drawing on the gall-bladder and ducts causes pain referred to the back. The appendix is absolutely insensitive, but ligating or drawing on the mesenteriolum causes a pain similar to an intestinal colic, which is referred to the region of the umbilicus with gagging, and if persisted in, vomiting may be induced. This may be prevented very readily by simply injecting the root of the mesenteriolum with the anesthetizing fluid. The same kind of a pain may be produced by drawing on the mesentery of any part of the intestine, and it is so characteristic that it may be called the intestinal pain.

As the principle of nerve-blocking consists in reaching the nerve in continuity at the most accessible point between the part to be operated on and the spinal cord or the brain, it necessarily follows that one should be a good anatomist in order to block successfully. One should know, too, the limitations of the method, although it may be said that its field is continually increasing with improved technique.

We will take up now its limitations and its availability more in detail. As might be expected the method is not

suited to operations on infants or children too young to be governed by reason, as they resist and struggle through fear, uninfluenced by the presence or absence of pain, yet I would not place a definite age limit, as I have operated on a little girl of five years for a good-sized inguinal hernia without any difficulty. The limitation is not so much one of age as one of uncontrollability. An adult may be uncontrollable as well as a child.

Almost any operation may be done on the lower extremity by blocking the sciatic at its exit from the pelvis, or at the gluteal fold and the anterior crural at Poupart's ligament. If the operation is in the region supplied by the lesser sciatic, or the external cutaneous, these nerves likewise must be blocked. The upper extremity may be operated on by blocking the brachial plexus at the root of the neck, or for operations on the forearm or hand, the nerve trunks can be easily reached in the arm. The superficial cervical plexus is blocked for operations on the neck and there is nothing more satisfactory than an operation for goitre under nerve-blocking. Operations on the face, tongue, and scalp can be done, and I have trephined twice, both patients expressing themselves as suffering no pain.

The complete operation for the removal of the breast and axilla can be done by blocking the brachial plexus, the acromial and clavicular branches of the superficial cervical plexus, and from four to six of the intercostal nerves.

The method is ideal for hernias as the region is so easily blocked by injecting the iliohypogastric and the ilio-inguinal nerves near the anterosuperior spine of the ilium. One of the most satisfactory regions to block is the perineum, including everything from the sacrum behind to the symphysis in front in either sex. This region is blocked by injecting into the sacral canal. A needle about 10 to 12 c.c. in length is introduced into the sacral canal through the open space between the sacrum and the coccyx. This space is

closed with a dense ligamentous structure which is readily recognized as soon as the needle touches it. The patient is placed on the right side with the limbs sharply flexed. With a fine hypodermic needle the skin and subcutaneous tissue are injected so there will be no pain on passing the larger needle. The long large needle is then introduced detached from the syringe at an angle of about 45 degrees with the surface of the body at that point. The needle is introduced into the sacral canal a distance of from 5 to 7 c.c. One should now wait a few seconds to see that no blood or cerebrospinal fluid escapes from the needle; the one indicating that the point of the needle is probably in one of the larger veins surrounding the cauda; the other that the needle has punctured the lower end of the sac of the central spinal canal. In either case the fluid should not be injected until the point of the needle has been changed to another location. The spinal sac usually ends at about the upper edge of the third sacral vertebra. When the needle is in the proper place from 30 to 40 c.c. of a 1 per cent. solution, containing from 0.25 to 0.5 per cent. of calcium chloride is introduced slowly. Anesthesia begins in a few minutes and extends from behind forward. It requires, as a rule, from twenty to thirty minutes for the anesthesia to be complete. Occasionally I have found that the amount first injected was insufficient to produce complete anesthesia, so now I do not withdraw the needle at once but allow it to remain *in situ*, and if on testing the part at the end of ten or fifteen minutes it seems that the anesthesia is not going to be complete, 10 or 15 c.c. more of the fluid may be injected. In this way complete anesthesia can always be produced. Under this anesthesia any operation on the lower bowel, perineum, vagina, vulva, urethra, cervix, prostate, etc., may be performed without a particle of pain.

By regulating the amount of fluid injected the anesthesia may be made to include the entire sacral plexus.

For operations on the kidney the eleventh and twelfth dorsal and first lumbar nerves are blocked as they escape from the intervertebral foramina. The abdominal wall may be blocked at any point so that the cavity may be opened painlessly. Any operation within the cavity may be done which does not draw on the mesentery or other peritoneal folds or ligaments, or which does not involve the unblocked parietal peritoneum anteriorly or posteriorly. So long as the manipulations are limited to those organs which are insensitive no pain is experienced. Packing off the intestines from the pelvis or other region necessarily draws the mesentery and the packing comes in contact with unblocked parietal peritoneum, hence pain is produced. Therefore, in operations involving the painful parts mentioned my plan is to open the cavity under nerve blocking, then give the patient a little nitrous oxide gas and oxygen, during those manipulations which are known to be painful. As soon as this part of the operation is finished, the gas is discontinued and the operation completed under the nerve-blocking. Following this method many of the cases receive no general anesthetic, some receive a little gas and all are awake and conscious long before leaving the table and throughout a large part of the operation.

Any method of producing anesthesia for surgical purposes if more or less new must possess some advantages over old and well-established methods if it hopes to gain general recognition. The question, therefore, at once arises, what advantage has nerve-blocking over general anesthesia as produced today.

In the first place it is less dangerous. It will be admitted that practically all substances used for this purpose are more or less toxic, but the degree of toxicity is comparatively well known, and as the substances are injected locally to affect nerve trunks and not used generally to affect nerve centres, it is easier to guard against an overdose.

The method is devoid of the dangerous and unpleasant complications which so frequently follow the use of general anesthesia, particularly ether and chloroform, such as pulmonary irritation, pneumonia, nephritis, suppression of the urine, acidosis, nausea, vomiting, headache, gaseous distention of the stomach, etc. Patients recover from the effects of the anesthetic much quicker, in fact they frequently are able to take, and often ask for, drink or light nourishment on reaching their room. Without wishing at this time to enter into a discussion of the nature and cause of shock, it may be said that if the blocking is complete no shock whatever follows operations done by this method, save that due to loss of blood, for without afferent impulses no shock follows injury.

The presence of consciousness is no disadvantage, in fact it is frequently of great advantage to have the patient conscious.

In my experience the great majority of patients prefer being conscious and look upon the loss of consciousness as one of the greatest drawbacks to an operation. The psychic element in these cases has been greatly overestimated. The horror of an operation is based on: (1) the fear of pain; (2) the loss of consciousness; (3) apprehension as to the outcome. The assurance that there will be no pain eliminates the first element. The fact that consciousness is not lost eliminates the second. The third element, or apprehension as to the outcome, is present just the same whether the patient be conscious or unconscious. I have found, however, that patients are inclined to look upon operations that can be done without the loss of consciousness under nerve-blocking as less severe than when a general anesthetic has to be used.

One other thing in favor of nerve-blocking is that it teaches the surgeon to be more gentle and more considerate of the patient.

It is surprising what can be done in the abdomen, for instance, by being gentle, without producing pain, and there is no doubt that the less the tissues and organs are mauled about, the less shock there is, whether the patient be conscious or unconscious.

It is desirable in many cases to give a hypodermic of morphin and atropin or scopolamin about three-quarters of an hour before the operation, as it quiets the patient and relieves the irksomeness of lying still in one position so long.

During the past few months I have done under nerve-blocking 234 operations on 217 patients. The following list shows the wide applicability of the method.

OPERATIONS

Angioma venous	1
Amputations, breast	7
leg	5
foot	1
scrotum	1
Adenitis, cervical	5
inguinal	2
Appendectomy	34
Adhesions, abdominal	5
duodenal	2
Cysts, cheek	1
ovary	5
breast	3
Cystocele	2
Colostomy	1
Carbuncle, neck	2
Cervical rib	2
Cirrhosis, liver (Talma's operation)	1
Decompression operation, skull	1
Epithelioma, lip	2
inguinal region	1
Exostosis, os calcis, both	2
Fractures, plate	1
reduction	3
Fistula, rectal	9
appendicial	1
Gastrostomy	1
Gastro-enterostomy	1

Hernia, inguinal	34
femoral	1
ventral	3
Hemorrhoidectomy	14
Hydrocele	3
Hysterectomy	6
Ileocolostomy	1
Intestinal obstruction	2
Kidney fixation	4
Osteomyelitis, leg	2
Polypi, rectal	1
cervical	1
urethra	1
Perineal section	2
Prostatitis (drain)	1
Perineorrhaphy	4
Peroneal nerve sutured	1
Ptosis, eye-lid	1
Rectocele	1
Rupture, patellar ligament	1
Resection rib	2
Submucous fibroid, *via* vagina	1
Subphrenic abscess	1
Stone, kidney	1
ureter	1
bladder, urinary	2
bladder, gall	3
Scar tissue, finger	1
neck and chin	1
Sphincter (rectal) dilatation	1
Thyroidectomy	13
Trachelorrhaphy	1
Ulcers, rectal	1
Uterus, fixation	3
Varicocele	3
Tumors, intestine	1
abdominal wall	3
urinary bladder	1
Cystostomy (suprapubic)	2
Anesthesia for other operators	3
Number of patients operated on	217
Number of operations performed	234
Number of failures	6
Number of cases in which gas was used in addition to blocking	27

There were 7 deaths; 2 due to hyperthyroidism, 2 to uremia following prostatectomy, 1 to delirium tremens, 1 to acute dilatation of stomach on the fifth day and 1 on the seventh day following extensive removal of the cecum and ascending colon for carcinoma.

SPINAL ANESTHESIA IN GYNECOLOGY

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Before an audience which is thoroughly familiar with the history and technique of spinal anesthesia only the two following questions require discussion: (1) Is there a field for an anesthesia other than the popular ether drap method, and (2) Do the results obtained with spinal anesthesia justify its wider application in gynecology?

It may at first seem somewhat dogmatic to assert that the severity of an operation stands in direct proportion to the amount of ether inhaled. But one has only to watch the work of surgeons who are giving particular attention to the subject of anesthesia to see a conscious effort throughout to reduce to a harmless minimum the quantity of ether administered. If we turn to the professional anesthetist we hear him[1] propose the slogan "Conserve the patient's resistance," and warn against ether as an anesthetic which impairs physiological agencies. "To handicap Nature needlessly with the anesthetic is sometimes to turn the tide of battle against the one we are striving to aid." And if still further proof were needed for the premise that the popular ether anesthesia is not an ideal procedure and therefore not applicable in all cases, we have but to recall the multitude of modifications, the many inventions of new methods, and the numerous combinations of old and new modes of anesthesia which have been proposed within the last ten or fifteen years.

Statistics would quickly settle the question, but, unfortunately, there are no reliable statistics to be had. Note the wide divergence of the figures collected by Gwathmey.[2] While in Europe one death occurred in 16,302 ether anesthesias, in America the proportion was 1 to 5623, and neither percentage is conclusive. I know personally of several ether fatalities that have never found their way into print and statistics, and I am sure that most of you have made similar observations. Nor does the immediate mortality rate, even if it were correct, tell the whole story. If the patient survives the operation itself but dies a few days or weeks later, it is at present impossible to state to what extent the anesthesia account should be charged with the fatal outcome, but it is not unreasonable to suppose that the anesthetic had something to do with it. The statistics of Petren[3] are at least suggestive in this respect. He studied the causes of death after all operations performed within the last five years in all the hospitals of Lund, in Sweden. There were in all 8440 operations with 304 deaths. Of these, 44 were due to pneumonia and 15 to pulmonary embolism—one-fifth of all postoperative deaths due to causes which are generally attributed to the effects of inhalation narcosis.*

We believe and we teach that there is no better protection against peritoneal infection than the peritoneum itself. Yet, a certain percentage of our cases still die from sepsis, and the man who could show accurately in how far the anesthetic weakens this protective barrier would render us an immeasurable service.

The relations between anesthetic and postoperative morbidity which, though it may eventually terminate in recovery, yet, entails physical suffering and often also economic hardship, are even more elusive to the statistician,

* I am, however, aware that pulmonary complications may sometimes follow abdominal operations even when ether has not been used.

but none the less real. Certainly the men who modified the ordinary ether narcosis or invented new methods must have been actuated by unfavorable experiences which rendered changes desirable, and not by a wish "to drive in nails upon which to hang their names."

All these innovations, however, have found only a very limited following, and from one end of the continent to the other the open ether method still reigns supreme. This is the more remarkable as every operator consciously or unconsciously is in everlasting dread of ether. He feels that every drop of it means an additional risk to his patient, and it is partly for this reason that he performs his task with an excessive speed which is not always consistent with the best interests of his client. In the case of a physician requiring surgical treatment, it is a common observation to see him shrink—not from the operation, but from the ether narcosis. Yet, so strong is habit that the majority, despite their fears, prefer to inhale ether and, metaphorically speaking, bury their heads in the sand so as not to hear or see anything.

Lest there be a misunderstanding, let me state emphatically that this is not an argument for abolishing ether inhalation altogether, but a protest against its indiscriminate employment. Neither can it be my purpose to recommend spinal anesthesia as an all-sufficing method of surgical anesthesia, for it would obviously be just as bigoted to become wedded to this or, indeed, any other single method and to forget that not our personal predilection but the needs of the individual case alone must govern our choice of an anesthetic.

The German and French literature once so full on the subject, now contains but a very few reviews of large series of cases operated upon under spinal anesthesia. This can mean but one thing, namely, that the value of this procedure has been established beyond a doubt and that the

question has been practically settled. In Italy and Russia the interest in the method is increasing, to judge from a fairly large number of contributions listed in the *Index Medicus*. From England and British India series of a thousand and more cases are recorded by individual operators, and only in America is the number of reports small and remains limited almost altogether to the same few men who have practised, and written on, spinal anesthesia for years. Yet, from personal observations and private communications, I am inclined to think that this method is really more widespread in this country than would seem at first sight, and I therefore consider it most appropriate at this time that an authoritative body like the American Gynecological Society should discuss the question so that any merely conventional objections may be properly dealt with. But there is another reason why our Society is the right forum for this discussion, for it should be remembered that it is in the field of gynecological operations that spinal anesthesia is of the very greatest advantage and shows its most impressive results.

It is but natural to anticipate at once a query as to the mortality from spinal anesthesia. Unfortunately, here again statistics fail us, as demonstrated by the wide divergence of the figures reported. While Hohmeier and Koenig computed 1 death in 200, and Strauss 1 death in 3500 spinal anesthesias, Thomaschewsky recorded 1 death in 17,847 cases.[4]

The majority of fatalities occurred a number of years ago when spinal anesthesia was still in its infancy. It is a sad but inevitable fact that in our empirical science, and particularly in surgery, every progressive step exacts its toll of human lives. In spinal anesthesia the anesthetic itself, has, I believe, nothing to do with the mortality. The three agents which alone need be considered for clinical purposes—stovain, trapococain, and novocain, are more or

less equivalent. While my personal experience is limited to novocaine, spinal anesthesia will be treated in this article without reference to a particular drug.

The safety of spinal anesthesia depends first and foremost on its accurate technique, as it has been evolved in the last twelve years. Although the injection into the arachnoidal sac is a very simple procedure, yet the strictest observance of even the minutest detail is of paramount importance. To all who wish to employ spinal anesthesia I earnestly recommend the description of the technique by Sellheim,[5] which takes into account every particular step of the method. Thanks to improvements in technique, the serious complications of former days have almost altogether disappeared. Death from spinal anesthesia is due to paralysis of the respiratory centre in the medulla caused by the rapid ascent of the anesthetic; and this disaster can practically be avoided, as attested by the thousands of cases operated upon by Kroenig,[6] Sellheim,[5] Morrison,[7] Dax,[4] Schuette,[8] Helm,[9] Allen,[10] and many others. One must agree with Kroenig when he demands that any reports of death due to spinal anesthesia must hereafter contain all details of the technique employed before they can be admitted to serious consideration. A case in point has recently been published by A. E. Rockey[11] but cannot claim any weight in this question as the report contains neither the amount and concentration of the anesthetic used nor the exact mode of injection.

The number of deaths from spinal anesthesia which have occurred in spite of all precautions, is undoubtedly very small and must be classed with those unavoidable accidents which are due to our human limitations.

If the anesthetic reaches the medulla in less than the toxic dose, collapse will be the result, a complication which has steadily decreased in frequency with growing experience. I have observed it but once in one of my earliest cases,

that of a stout and asthmatic woman with nephritis and a flabby heart in whom a vaginal hysterectomy was to be performed. In this case a typical collapse occurred when the patient was brought too abruptly from the sitting into the dorsal position even before the operation had commenced. An injection of strychnine and the introduction of oxygen quickly revived her, and the operation was successfully and painlessly carried out.

Minor complications such as air hunger and tendency to fainting are probably due to the decided effect of spinal anesthesia upon lowering the blood pressure. They are readily combatted by stimulation, but usually subside without any treatment.

But if there is no longer any physical danger, is not the psychic trauma a serious drawback? This objection is caused by a gross misconception of the actual conditions. The patient is not conscious in the sense in which the operator or the audience are conscious. It should be borne in mind that the patient's sensibilities are dulled when she enters the operating room. She has received bromides the day before the operation and a dose of veronal at bedtime, and she is under the influence of an injection of morphine-atropin or morphine-scopolamine when spinal anesthesia is about to be administered. In many of the German clinics, she is brought to the table in "twilight sleep." The intraspinal injection itself is no more painful than the hypodermic injection given half an hour previously, and since the operative manipulations are not perceived, the preliminary administration of morphine can exert its soporific influence to its fullest extent. It is interesting to compare the apprehensive attitude of by-standers with composed frame af mind on the part of the patient. The operator himself may at first be affected until the novelty of the experience has worn off. His nervousness is quite pardonable for we all are more or less creatures of habit

and we have become used to see our patients in a state of unconsciousness. Personally I prefer to chat with my patient during the operation rather than hear her labored breathing, her deep snoring, or the rattling of mucus in her throat, all of which remind me unpleasantly of the interference with unobstructed oxygenation of her blood.

Let us consider further advantages of spinal anesthesia during the operation. Some patients are nauseated and even vomit, but almost without exception the emesis is very slight and rarely occurs more than once. The nature of the operation is not the cause, for the vomiting may occur even before an incision is made. Allen and Donaldson[12] found that they could diminish nausea and emesis still further by giving a light breakfast before the operation.

The abdominal walls are more fully relaxed than with any other method of surgical anesthesia, and the intestines remain, in most cases, quietly within the peritoneal cavity. This facilitates the applications of retractors, and diminishes traumatism to the abdominal parietes; it obviates brusque handling of the viscera with its well-known sequels, frequently eliminates the use of gauze packs, and generally renders operative manipulations easier. All this tends to lessen the operative shock, and as nerve impulses do not reach the brain, spinal anesthesia is the ideal measure of anoci-association. "With most other anesthesias, the shock of a prolonged operation is reinforced by the progressive toxemia of the anesthetic. With spinal anesthesia the emergence of the nerve roots from the anesthesia as the operation proceeds, usually results in the patient's leaving the operating table in a better condition than he was during the early stages of the aperation." (Babcock.[13])

It is quite true, that analgesia is not perfect in all cases. Indeed, to claim invariably good results would be to invite a justifiable scepticism; and on the other hand, an occasional failure in obtaining complete freedom from pain should

not be sufficient to condemn the method. There are two possibilities: Either an attempt at spinal injection fails altogether, or else the spinal injection having been made, analgesia is more or less incomplete. Thus far, I have been unable to perform spinal anesthesia in 6 cases. Twice the tumors were monstrously large so that the patient could not bend forward and thereby separate the vertebræ sufficiently for the introduction of the needle. In three cases, two of them complicated by obesity, the needle entered the spinal canal, but no fluid escaped indicating, perhaps, abnormal conditions within the arachnoidal sac which rendered the injection of the anesthetic inadvisable. In one instance, the spinal fluid was mixed with blood, and the injection, therefore, omitted. In such a case, a part of the anesthetic would leak into the circulation, and the remainder would *a priori* be insufficient to produce analgesia.

In about 150 cases where spinal injection was performed, analgesia was insufficient on three occasions, so that a general anesthetic was required throughout the operation. This was due to faults in technique which I hope to avoid in future. Repeatedly, a few whiffs of ether had to be given, either in the beginning, because of great nervous excitement of the patient, or else at the end of long and severe operations. Not infrequently the inhalation of alcohol or some aromatic oil (oil of lavender or orange) has had a satisfactory though only suggestive effect.

Whatever the causes be, one simply has to count on a certain small percentage of failures. For this fact we have enough statistical material of which I select a few of the more recent reports. Kroenig: In 2140 gynecologic operations, chloroform or ether was added in 1127 cases, counting even the smallest amount given. Sellheim: In 1000 operations, complete and undisturbed anesthesia was observed in 86.1 per cent. and a total of disturbances in 13.9 per cent. Morrison: In 1295 cases a general anesthetic was

required on 36 occasions—throughout in 17 operations and during the latter stage in 19. Allen: 320 cases with 19 partial or complete failures to produce anesthesia. Helm: 1419 cases with 105 failures, 7.4 per cent. Dax: In 1500 cases there were 6 complete failures, 37 incomplete analgesias without addition of a general anesthetic, and 38 incomplete analgesias with addition of a general anesthetic.

After all, the addition of a minimum amount of ether which is too small to injure the organism, is not a serious disadvantage. In one of my cases a difficult abdominal panhysterectomy for large bilateral pus tubes with extensive adhesions, which lasted almost one and one-half hours, 190 drops of ether were used, and I consider this preferable to repeating the spinal injection as recommended by Richardson[14] and others.

The range of spinal anesthesia in our special field of work is unlimited. The following tables of my operations will show at a glance that every kind of gynecologic operation can be done with its aid. As in some instances, multiple operations were performed on the same case, the number of patients subjected to spinal anesthesia is slightly smaller. Minor operations, such as curettages, trachelorrhaphies, amputations of the cervix, or hemorrhoidectomies which were done in conjunction with major procedures have been left out of consideration.

Of these cases, four have died. These fatalities which occurred about two years ago, have already been reported in my paper at the meeting of the American Medical Association in Minneapolis, June, 1913, but may here be repeated for the sake of completeness. It is, perhaps, significant that spinal anesthesia was insufficient in two of these four cases, and ether had to be given from the beginning. One of these was an extended vaginal operation for cancer of the cervix. This patient died of shock. The other patient died of peritonitis possibly caused by an injury to the

TABLE I.—ABDOMINAL OPERATIONS

Panhysterectomy for fibroids	13
Panhysterectomy for cancer of cervix (Wertheim)	2
Panhysterectomy for cancer of ovary	1
Panhysterectomy for pus tubes, ovarian abscess, etc.	10
Hysterectomy for cancer of body	1
Hysterectomy for postoperative adhesions, etc.	3
Enucleation of fibroids	1
Supravaginal amputation for fibroids	5
Supravaginal amputation for intraligamentous ovarian cyst	1
Ovariotomy	1
Salpingo-oöphorectomy	15
Ectopic pregnancy	6
Postoperative hernia	5
Herniotomy	1
Salpingostomy	7
Appendectomy	28
Operation for retroflexion (Montgomery, Baldy, etc.)	16
Operation for cystocele	4
Exploratory	3
Nephrotomy	1
Implantation of ureter into bladder	1
Total	127

TABLE II.—VAGINAL OPERATIONS

Hysterectomy for fibroid	3
Hysterectomy for cancer of body	1
Hysterectomy for rectovaginal tumor	1
Hysterectomy for metrorrhagias	2
Radical hysterectomy for cancer of cervix (Schauta)	5
Hysterectomy for prolapse	3
Interposition (Watkins-Schauta)	3
Vineberg operation for prolapse	4
Ovariotomy	2
Cesarean section in patient with exophthalmic goitre	1
Enucleation of submucous fibroids	2
Operation for complete tear	2
Perineorrhaphy	9
Vesicovaginal fistula	1
Rectovaginal fistula	1
Dudley operation for incontinence of urine	1
Excision of vulva for cancer	1
Total	42

intestines. The remaining two patients died of sepsis; one had cancer of the cervix and died five days after a Wertheim operation; the other had a large myxomatous fibroid with most extensive adhesions and died two weeks after operation.

The postoperative course, as a general rule, cannot fail to impress an open-minded observer.

The surgeon is familiar with the postoperative behavior of his patients more in a theoretical way, if I may so express it. He sees them at short moments only, and it is the nurse who is constantly with the patient who is more competent to judge any differences in the patient's condition after spinal or ether anesthesia. It is, therefore, an argument of weight if experienced nurses without exception declare that the postoperative care of "spinal cases" is infinitely easier; that vomiting is in the majority of patients lessened to a minimum or altogether absent; that nausea and thirst are diminished, the general malaise reduced, the sharp wound pain markedly decreased, the ability of taking nourishment, and thereby aiding the resiliency of the organism little or not at all impaired; micturition and peristalsis are usually uninfluenced by spinal anesthesia. But the best argument is advanced by those patients who had both kinds of anesthesia and declare in favor of the spinal injection. I can refer to several such cases. In one instance, the patient had been operated upon elsewhere under ether a year ago and again by me under spinal anesthesia, and when a small perineal plastic operation became necessary, which I intended doing under ether, the patient vigorously objected and insisted on having spinal anesthesia a second time. Do not such observations outweigh any theoretical objections?

There is, however, no denying that in a certain percentage of cases, annoying by-effects are noted after spinal anesthesia. The most objectionable post-operative symptom

is headache, usually of the occipital type, which may be more or less intense and last for hours and days. In its graver form I have observed this complication but once. It existed from the third to the ninth day after operation, but finally yielded to hot packs. The milder forms are usually relieved by bromides. Such headaches are possibly due to a delayed absorption of the anesthetic. Kroenig has observed headaches in 897 out of 2074 cases or 47 per cent. He remarks that the choice of the anesthetic plays no part in the causation. The frequency and intensity of headaches seems to him to depend more on the social stratum and the age of the patient. Wage earners, women from rural districts, and those beyond the age of fifty suffered less; neuropathic individuals suffered severely from these headaches.

Morrison noticed headaches in 15 per cent. of his cases and found that persons prone to headaches on slight cause furnished the largest group. Schuette believes that patients suffering habitually with headaches, should be excluded from spinal anesthesia; he observed that coffee or brandy given immediately after operation seemed to exert a preventive effect.

Backache lasting one or two days was noted in ten of my cases. An ice-bag applied to the site of injection usually relieved the symptom. No notes have been made of backache after a corresponding number of general anesthesias.

In two instances the bedside notes recorded numbness in the legs, and one patient complained of pain in the feet on the day following the operation. Usually, however, free mobility of the legs is regained within an hour or two after operation.

A partial paralysis of one leg, which, however, gradually subsided, was observed in one case in which the needle was not introduced in the median line and probably pierced one of the sacral nerves.

One patient who had stood an abdominal panhysterectomy for fibroids exceedingly well, developed a slight psychic disturbance during the next two days, but eventually recovered completely. Siemering[16] quite recently mentioned a case of mental disturbance (amentia) after a gynecologic operation which terminated in spontaneous recovery, and concluded therefrom that patients with an unstable psychic equilibrium had better be subjected to general narcosis.

Alarming late complications which were now and then reported in the earlier days of spinal anesthesia seem to have become less frequent, and all authors agree nowadays that lasting ill effects are conspicuously absent. Among Heim's 1419 cases there were 174 with late complications, such as headaches extending over months, parasthesias, and neuralgias of the legs, etc., but all were cured finally. He suggests that these were perhaps due to slight infections and recommends increased attention to asepsis.

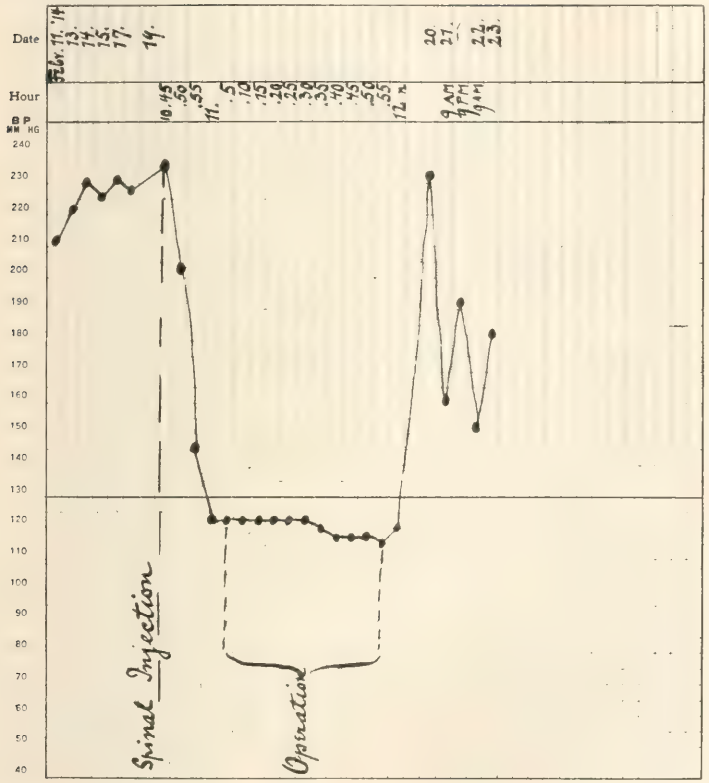
That such complications, however, cannot always be charged to spinal anesthesia is proved by a case that came to my knowledge recently. A woman developed paralysis of both legs soon after myomectomy in spinal anesthesia, but when she was seen about two years later, she exhibited the typical picture of tabes and Wassermann reaction proved positive.

At times postoperative symptoms may give rise to grave fears and yet subside spontaneously. Such a case was reported by Vogel and Kraemer.[17] A man of seventy-five years, suffering with asthma, was subjected to herniotomy in spinal anesthesia. After operation there ensued a complex of symptoms resembling heart-block and consisting of bradycardia (36 beats a minute) dyspnea, insomnia, debility and tenesmus, but all these symptoms disappeared gradually.

It seems to me that we have to deal here with an unusually pronounced effect of spinal anesthesia upon the blood

Gyn. No. 363

Blood-pressure. Name, Mrs. N. M. Ward I



● Systolic. ○ Diastolic. Apparatus, Faught.

pressure. Babcock has paid particular attention to this phase of the problem and has observed that the involvement of the upper dorsal nerve roots causes a slowing of the pulse down to 40 or 30, while the blood pressure may sink to its lowest level. The involvement of only the lower spinal segments may produce merely a slight reduction of the pulse rate and blood-pressure. The action on the circulation begins soon after the motor paralysis reaches its acme or in about fifteen or twenty minutes, and gradually passes off.

That the strict observance of an improved technique would, in all probability, avert an involvement of higher segments, has already been mentioned; but even when the injection has been done with all necessary precautions, the effect on the blood-pressure may be quite marked, as exemplified in the accompanying chart.

Morrison found a faint and transient albuminuria in a few patients whose urine was free from albumin before the operation.

A more regular phenomenon which thus far seems to have escaped the attention of observers, is the appearance of acetonuria after spinal anesthesia. My findings will later be reported in detail. For the present it may suffice to say that out of twenty cases, acetone occurred in the urine in all but one case. The acetonuria disappeared spontaneously about five days after operation, and in no instance did it affect the general condition of the patient or interfere with the recovery.

The occurrence of all these more or less annoying by-effects enumerated above and even the possibility of more serious complications must be clearly understood, if a true picture of spinal anesthesia is to be developed. On the other hand, the undesirable sequellæ should not be unduly magnified so as to overshadow the truly remarkable possibilities of the new method. It has been shown in Tables

I and II that *all* gynecologic operations can be performed in spinal anesthesia. It remains to be said that in a large number of these cases the condition of the individual patient was such as to strongly contra-indicate the inhalation of ether unless the additional danger from narcosis was to be superimposed upon the risk of the operation itself. My own 169 operations are so few that I would not venture to refer to them were it not that operators with an infinitely larger material have already shown us the brilliant achievements of spinal anesthesia in operative series of impressive size. Like many others, I have employed spinal anesthesia at first only in cases in which I was afraid to operate under ether—serious or debilitating diseases complicated by myocarditis, nephritis, exophthalmic goitre, advanced age, etc., and only when spinal anesthesia stood this particularly severe test, did I extend the application of the method, without, however, losing sight of the legitimacy of ether or nitrous oxide in suitable cases.

What, then, are the indications for or against the use of spinal anesthesia?

Doederlein and Kroenig regard as the chief advantage of spinal anesthesia the fact that we have to deal in the main with a form of local anesthesia in which the greater part of the poison is deposited around the site of the injection, and is thus rendered harmless, while in every inhalation narcosis the poison enters the circulation and produces undesirable toxic effects on the other organs, particularly the heart and lungs. Therefore, postoperative cardiac disturbances and pneumonias occur far less frequently after spinal anesthesia than after inhalation narcosis.

It is, moreover, a matter not of theory but of actual experience that patients with pulmonary troubles or heart lesions bear a spinal anesthesia better than inhalation narcosis. The same is true of patients with kidney disease or diabetes, and it has further been proved that operations

on aged people lose many of their dangers when performed under spinal anesthesia.

Bainbridge[13] sums up the question by saying tersely: "The indications for spinal anesthesia are the contra-indications for inhalation anesthesia."

It has abundantly been proved that spinal anesthesia is less dangerous than ether, and if its employment is not only justified but demanded in "bad" cases, it is but logical to use it in cases which are not complicated by other organic or systemic disturbances.

As a matter of fact, Doederlein and Kroenig, Allen, Babcock, and most of the other operators with large personal experience draw just this conclusion. They prefer spinal anesthesia over inhalation narcosis in all operations with a high mortality, such as operations for cancer and fibroid; but since there is a certain degree of risk in any laparotomy, they use spinal anesthesia in all abdominal operations in preference to inhalation narcosis.

That the storm and stress period of spinal anesthesia has passed and mere enthusiasm has given way to wise caution is shown by the list of contra-indications in which most authors concur. This includes pronounced kyphoscoliosis and other marked anomalies of the spinal column, and pressure points along the spinous processes, which might indicate abnormal conditions within the arachnoidal sac, such as adhesions or lack of cerebrospinal fluid; furthermore, diseases of the central nervous system, profound shock, or marked hypotension from other causes, sepsis, and fevers of unknown origin. Spinal anesthesia is also contra-indicated in neuropathic individuals and where there is a strong prejudice against the method. Whether it is applicable in children is still a mooted question in which I have no personal experience. I can affirm from numerous observations that syphilis is not the contra-indication it was formerly believed to be.

Suppurations and eruptions near the desired site of injection forbid the use of spinal anesthesia until aseptic conditions can be established.

I have endeavored to present to you the present status of spinal anesthesia in as objective a fashion as my own leaning toward the new method would permit, and to draw a picture in which light and shadow are evenly divided. Since Roentgen's discovery, no greater, no more stupendous advance in our therapeutic procedure has been made than this method of rendering the most extensive operations absolutely painless. For this we gynecologists above all others must feel particularly grateful to Corning, Bier, Tuffier, and all those who with indefatigable zeal have improved the technique of spinal anesthesia until today it appears to be perfect in all its essentials. Spinal anesthesia has had to face skepticism and prejudice. The former must yield before the positive proofs which the advocates of spinal anesthesia can produce, and prejudice will eventually wear itself out. If Donaldson complains that despite the gratifying results of his first years' work, prejudice on the part of the public, both medical and lay, has interfered with his efforts, he may remember that less than eighty years ago the followers of Ephraim McDowell were publicly denounced as murderers and subjected to persecution.

But ovariotomy has survived prejudice and so will spinal anesthesia. A method by which many human lives may be saved, cannot disappear from our therapeutic treasury, and it requires no prophetic gift to predict that from year to year it will become more appreciated and maintain its high place among the methods of surgical anesthesia.

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DISCUSSION OF THE PAPERS OF DRS. GATCH, HENDERSON, HARRIS AND GELLHORN

Dr. Freeman Allen, of Boston, was asked to open the discussion on these papers. Dr. Allen said: In opening the discussion on Dr. Gellhorn's admirable paper it is only fair for me to say that my experiences with spinal anesthesia include very few gynecological cases, and are chiefly confined to cases of genito-urinary surgery and general surgery.

While I am an ardent advocate of spinal anesthesia in certain cases, yet as a professional anesthetist I feel called upon to say a word defending ether. I feel that a great deal of the condemnation that ether has been receiving lately is due to the fact that surgeons and patients have been the victims of unskilful administration of ether. There is a radical difference between an ether anesthesia administered by a skilful professional and

one carried on by a person of small experience. I think that surgeons are much too apt to put up with administrations of ether by persons who are comparatively unskilful and then to blame ether anesthesia in general. They are apt to accept as inevitable the statement of the person administering the anesthetic that "the patient is too difficult to control by ether, has not been properly prepared, and is a poor subject for ether," etc. However, if I were a surgeon and lived in a community where the services of a really skilled anesthetist were not obtainable I should certainly use spinal anesthesia very largely if not exclusively. It is certainly a wonderful form of anesthesia, producing results often so utterly satisfactory as to make us believe that the ideal anesthesia has been found at last. Nothing can be more perfect, from the point of view of the patient, of the surgeon, and of the anesthetist, than the course of an operation under spinal anesthesia when it works well. And I must say here how thoroughly I agree with Dr. Gellhorn when he points out that there is no psychic shock whatever when a patient has been properly prepared for spinal anesthesia and is properly handled during the same. The only psychic disturbances in evidence are those of the surgeon and his assistants, if they are unused to operating under this form of anesthesia. As I have pointed out before it is important to leave a patient under spinal anesthesia alone just as much as possible. It is a great effort for them to converse when under the influence of narcotics, and repeated questioning of them as to their sensations only disturbs them. Perhaps the most striking advantage to the surgeon is seen in laparotomies, especially in acute peritoneal conditions, where the absolute relaxation of the abdominal walls and the flaccidity of the intestines is greater than that seen in profound chloroform anesthesia, and far exceeds anything that could be produced by ether.

An operation properly conducted under a perfectly working spinal anesthesia fulfills all the indications of Crile's and Lower's admirable anoci-association work, except possibly in the period of post-operative analgesia produced by quinine and urea, which could easily be used as an adjunct to spinal anesthesia.

There can be no doubt of the extreme value of this method in any form of surgery. It certainly has a distinct and increasing field of usefulness in surgery.

My own cases at present number 463—only 143 more than at my last report read at Atlantic City in June, 1912. But the use of this method since its introduction by me to this community in the autumn of 1910 has become fairly general. It is, for example, used almost as a routine by the genito-urinary service at the Massachusetts General Hospital, and largely in the private practice of the gentlemen connected with this service. It is also frequently administered and has been for the past two years by the resident surgeons at the Massachusetts General Hospital in emergencies, as railroad injuries, acute peritoneal conditions, like strangulated hernia, acute intestinal obstruction, etc.

Although my last report was most favorable to the method, I have felt for some time that its brilliant success in most cases tends to make us overlook the grave and alarming symptoms shown by a few cases. By far the greater number of my cases have been absolutely perfect anesthesias; that is to say, the patients have shown absolutely no unfavorable symptoms during or after anesthesia. A certain number of cases have shown during and after anesthesia mild and more or less transient and untoward symptoms. A few cases have shown during and after anesthesia distinctly grave and alarming symptoms.

To sum up: my attitude on this subject is now one of great caution, because every once in awhile I have had cases exhibit very alarming symptoms under spinal anesthesia, and that when every precaution had been taken to prevent too high an upward diffusion of the drug in the spinal canal. All my cases have come out all right except one, the case C. H., which I will now report.

Mr. C. H. was a sea captain, aged fifty-five years, a heavy, plethoric man. It was proposed to operate on him for the removal of the prostate. I saw him first the day of the proposed operation, Thursday, December 5, and ordered a preliminary hypodermic injection of gr. $\frac{1}{4}$ morphin and gr. $\frac{1}{150}$ atropin. When they were preparing to bring the patient to the operating-room I found he was in acute collapse, or that he was just recovering from the collapse. He as practically pulseless, and the cardiac signs were imperceptible at the apex, so that we decided to postpone the operation that day. We presumed that the collapse was due to an idiosyncrasy toward morphin and

atropin. December 9 we undertook the operation and at 8.15 in the morning injected the patient in the second lumbar interspace with 2 c.c. of 5 per cent. tropococain. There was no pain upon injection and there was a free flow of fluid. The 2 c.c. of 5 per cent. tropococain diluted with an equal amount of spinal fluid was injected slowly, that is, the average speed of injection. The patient was not held sitting up, but placed immediately in the recumbent position, with the head higher than the feet. No Trendelenburg position was used. In about six minutes the patient became pale and showed toxic symptoms—pallor, unusual sweating, cold extremities, clammy feeling. The patient was placed quickly in the lithotomy position and the rectum was emptied of hardened feces. After that the toxic symptoms increased in severity and the respiration became as bad as any respiration I have ever seen; it was gasping and the patient was barely breathing. In spite of that it was decided to begin and complete the operation of perineal prostatectomy. This was done. During the operation the patient was absolutely pulseless, perfectly white, and just barely breathing. The patient was put to bed at about half-past nine. About eleven the same morning the circulation came back, the patient was delirious, violent and twitching, kicking about; his pulse was 100; temperature at 11.45 was 104.4°; at 12.45 it was 101.3°. I saw the patient at this latter time and he was semidelirious and restless. That night the temperature shot up again to 104°, and he died the following morning at about 6 o'clock.

I should have reported this case as a death from spinal anesthesia had I not been advised by the surgeon connected with the case and other surgeons that it was not a death from spinal anesthesia, but might have been due to other causes. At the same time I will report it for what it is worth, and will be pleased to have the case discussed by the gentlemen present.

Dr. John O. Polak.—I do not feel that the admirable papers of Dr. Gellhorn and Dr. Gatch should go by without more discussion.

There is one point which Dr. Gatch made clear to us, that has explained to me a condition that has occurred frequently in our experience with the Fowler position following operation for septic conditions. If you remember, Dr. Gatch's contention

as to the effect of posture. On the intra-abdominal pressure the effect of the elevated trunk posture be apparent to you all, and I have to report two cases of severe shock coming on from the immediate use of the Fowler position after abdominal operations for general peritonitis where only a stab wound incision was made and drainage instituted. It has been our custom to have these patients placed in a horizontal position or moderate Trendelenburg position for the first few hours after coming from the operating-room to combat the point Dr. Gatch made. These two cases were put up in the Fowler position immediately and both were in the most severe shock as the result of it, and only by change of posture was the picture changed.

Regarding spinal anesthesia, during the last two years we have used it in a number of cardiac cases, cases of tuberculosis, diabetes, in whom we have had to do obstetrical or gynecological operations. In those extremely severe cardiac cases that complicate pregnancy the use of spinal anesthesia has certainly brought to us a new era of obstetric surgery in this way: all of us have had the same difficulties in these cases, particularly in advanced pregnancy with marked decompensation of the heart, where delivery has had to be accomplished by vaginal Cesarean section. By the use of spinal anesthesia the whole picture has been changed. We have had the advantage of blood-letting without any of the depressing effects of the anesthesia, particularly struggling and signs of cyanosis, etc., and the effects have been most admirable. In cases of tuberlosis in which the uterus has had to be emptied we have used it in I should say fifteen or twenty cases during the last year.

There is one point that Dr. Gellhorn made, and I would like to have him explain it, if possible, in his closing remarks, namely, that acetone has been more or less a constant sequel in these cases of spinal anesthesia. We have elected spinal anesthesia for operations on diabetics, and I would like to ask him if he thinks that makes the condition more serious, that is, the appearance of acetone in the urine.

I think there is a distinct field for special anesthesia in gynecological and obstetrical surgery in cases where it is dangerous to give general anesthesia.

I firmly believe that ether is better for us in most of these cases than gas-oxygen, especially when there is any decompensa-

tion of the heart because of the cyanosis and struggling produced in the administration of gas; and that spinal anesthesia preceded by the proper administration of morphin and bromides to produce narcosis, or in cases where the cardiac condition is such that you do not care to risk the depressing effect of veronal and bromides by preceding the anesthesia by morphin alone we get excellent results.

Dr. Seth C. Gordon.—It seems to me that something should be said on the other side of this question. I am by no means a man who objects to modern things. I have endeavored to keep up with the profession as far as possible; I am still a young man, as was said of me this morning. I have given ether and chloroform for fifty-eight years, almost for four years in the army during the Civil War. In the Department of the Gulf in the Southwest we used chloroform altogether. I have never seen but one death from chloroform, and that was in the case of a man who was wounded in the middle finger. He had no suffering when he took the chloroform. The result was that when I got ready to operate in ten minutes the patient was dead. Since my return from the army I have never used anything but ether in an experience embracing twenty-five years in a general hospital. I have never seen but one death which in my opinion was traceable to ether. A patient came who had quite a severe bronchitis, and I supposed she had partially recovered. I gave her ether, did an abdominal operation, but she died from pneumonia.

That has been my experience in the use of these two agents, and it has certainly been extensive in all these years.

I believe that we have come to take too much for granted in regard to deaths from ether and from chloroform. I believe that the main trouble has been in the administration of them, and that the more experience we have had and the more we have adopted modern methods (the drop method of ether) we have something that is almost absolutely certain in any case where we are obliged to resort to a surgical operation.

The first time I went to Europe, in 1874, the *Lancet* had every week from one to two deaths from chloroform. I said to a friend of mine who accompanied me at that time, I am going to write a little note and ask them why they do not use the American method of using ether. He said they will not pay

any attention to it. I wrote quite a conservative note, calling their attention to the deaths from chloroform, and asking them why they did not try the American method of using ether. At the end of the week, in its issue, the *Lancet* said, "The communication of Dr. Gordon is received with thanks," and that was all.

Fifteen years ago I had the pleasure of reading an editorial from the *Lancet* in which the author took the strongest attitude in regard to the use of the American method of using ether instead of chloroform, and said the time has come now, in our opinion, when Englishmen must give up the idea that they cannot use ether; we have had altogether too many deaths from chloroform, and if ether is properly given we believe it is much safer, and it should be used instead of so much chloroform. It was a very handsome endorsement of my position; I do not mean to say it was an apology, not by any means, because the editorial was written fifteen years later. I believe in many cases, and I have operated in all kinds of cases, the proper administration of pure ether is absolutely as safe as anything that can possibly be used.

Dr. M. L. Harris (closing on his part).—This is not entirely a question of deaths following anesthetics, but also a question of comfort for the patient during and subsequent to the anesthetic. If one could give ether in all cases and have them all recover from the ether it would not help us in respect to the after effects of the agent. They would be just the same.

Under nerve-blocking there have been no deaths, so it is perfectly safe from that stand-point. I have had occasion to operate on a number of patients who had undergone previous operations under general anesthesia, and without a single exception the patients have expressed themselves as infinitely preferring nerve-blocking, and would not think of taking a general anesthetic again.

On an average in all the clinics of Europe pneumonia follows ether anesthesia in 5 per cent. of the cases; pneumonia never follows nerve-blocking as a result of the anesthetic. In the 234 operations which I report here not a single patient had any lung complication whatever and 66 of them were laparotomies; just the cases in which we find a large percentage of post-operative lung complications. Laying aside entirely the ques-

tion of deaths, nerve-blocking still possesses such distinct advantages that we will have to use it. Patients come now and request to have nerve-blocking used in preference to general anesthesia. If we had some method of limiting the effects of an anesthetic injected into the spinal canal to the region that we want it limited to it would be ideal, but at the present time we have no method of limiting the effects of any substance injected into the central spinal canal. It not only diffuses itself as liquid substances will, but there is a distinct circulation in the central spinal canal, and any substance introduced or injected, high or low, is transmitted to all parts of the central spinal canal. That is a serious objection to intra-spinal injection of toxic substances. There is a big difference between central spinal canal anesthesia and nerve-blocking, one is a distinct peripheral blocking while the other possesses the principle of blocking the centres, and blocking the centres is a serious procedure. That is why so many of these patients have serious depression due to the fluid reaching the higher spinal centres. Until we find some way of limiting the anesthetic to a distinct level or to a certain part of the cord I think peripheral anesthesia or nerve-blocking must have certain advantages over intraspinal anesthesia.

Dr. George Gellhorn (closing).—I had fully expected to arouse antagonism because the few minutes at my disposal did not permit me to substantiate all my claims, which are, however, fully discussed in my paper. My statements, therefore, seemed so dogmatic that I anticipated objections on your part. That you have not uttered such objections shows, I take it, that you agree with my propositions, and I am certain that in your attitude you have been largely influenced by the splendid enodrsement given by Dr. Allen and Dr. Polak.

Dr. Harris, it is true, did not seem to like spinal anesthesia, and I will gladly admit that in operations on the extremities nerve-blocking seems a very good procedure, and perhaps the anesthesia of the future; but, after all, I know nothing about this field of surgery, and my recommendation of spinal anesthesia pertained solely to gynecological operations.

Dr. Gordon will kindly allow me to say that I do not wish to restrict the use of ether because it is not good, but because spinal anesthesia is better; and a German proverb says that the "better" is the enemy of the "good."

Two thousand years ago a Greek philosopher propounded the doctrine *παντα ῥει*. The word that everything is in motion is as true today as it was then, and none of us can afford to remain still when everything changes lest we all become rule-o'-thumb empirics.

MECHANICAL PRINCIPLES INVOLVED IN THE CAUSE OF BACKWARD AND DOWNWARD DISPLACEMENTS OF THE UTERUS

By George H. Noble, M.D.
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In the analysis of this proposition we should not be content with theory, but must know some practical things of the pressure within the abdomen under varying conditions, whether in the active or passive state and in normal and abnormal health. To determine these points, the writer made some experiments that seem to have been successful in arriving at a working basis.

An apparatus consisting of two rubber bags, one within the other was made, and to prevent over-distention and rupture a silk sack was placed between them. The triple bag thus arranged was connected by tubing to a Faught's blood-pressure apparatus for the purpose of correct reading.

When testing intra-abdominal pressure the collapsed bag was put within the inverted sack of suitable postoperative or other hernias free from obstructive adhesions, and a quantity of air sufficient to inflate without undue pressure was pumped into it (Fig. 1). The pressure was not enough to elevate the recording mercury column more than a few mm., above the level of its fellow. The zero mark of the graded scale was placed opposite the mercury level, and changes in the reading carefully recorded as tests were made.

Of the many points of interest developed a few relating to this subject are briefly recounted here.

In the normal subject abdominal pressure is nil when the patient is lying upon the back, but on assuming the sitting or standing position it increases to 18 mm. Tension of the abdominal wall in maintaining the upright position is sufficient to account for the change, the weight of the intestines not being great enough to produce the effect.

Squatting by compressing the viscera increases the pressure to 20 mm.

Inspiration in the recumbent position shows 5 mm. In the passive state the abdominal walls are more or less relaxed, and yield to diaphragmatic displacement, the reading, therefore, indicates normal muscular tonicity. When sitting or standing the muscles are tense, and resist the force of the diaphragm to a greater degree, and cause in these two positions respectively 18 and 30 mm. of pressure. Upon the other hand expiration in all postures mentioned failed to show any pressure whatever.

In coughing or straining at stool the muscles are more rigid and diaphragmatic contraction is greater; here, registration shows 40 and 30 mm.

If the testing bag is placed in the vagina beneath the cervix it will indicate 20 mm. less pressure than the abdomen before the pelvic floor begins to bulge; but when full distention occurs the reading on the scale reaches the maximum (average 80 mm. coughing).

The interpretation of this is, the uterine ligaments sustain 25 per cent. of intra-abdominal strain; beyond that they stretch sufficiently to transmit it to the levator muscle and its contiguous fascia.

In lacerations of the perineum with cystocele and rectocele little or no force is registered unless firm counter pressure is made with perineal pad or until the patient sits upon some hard substance.

In such circumstances the full force from the abdomen is measured in the vagina and at the site of the lacerated perineum. If the abdominal walls are much relaxed the pressure is less, for diaphragmatic displacement is dissipated before the abdominal muscles are put upon strain sufficient to create resistance. With the abdomen firmly bandaged and perineal counterpressure employed the test will show vaginal pressure equal to the abdominal.

Wherever there is force there is resistance, and this brings us first to a brief review of the arrangements and anatomy of the supports of the organs contained within the pelvis. For instance, the lumbar, transversalis, and iliac fasciæ line the abdomen external to the peritoneum and extending downward become contiguous with the pelvic fascia, which lines the pelvic cavity. It is attached to the bony framework of the pelvis; in front to the body of the pubic bone as far forward as the lower border of the symphysis, on the sides to the iliopectineal line, posteriorly just above the attachment of the pyriformis, and is finally lost on the anterior surface of the sacrum.

In its descent it divides into several layers the principal ones being the obturator and rectovesical. The latter passes downward over the inner surface of the levator ani muscle to join the fascia of the opposite side, effectually closing the lower end of the immense fibrous bag.

One layer of the rectovesical fascia is reflected over the bladder and becomes its fibrous coat. Another layer is reflected on to the uterus and curves backward external to the pouch of Douglass and is firmly attached to the ischial spine on either side.

In its descent in the pelvis, the pelvic fascia forms a true and a false bottom to the fibrous bag above referred to. The true bottom contains the several sheets in the pelvic floor, the deep pelvic, the triangular ligaments, and the rectovesical fascia in its relation to the levator ani muscle,

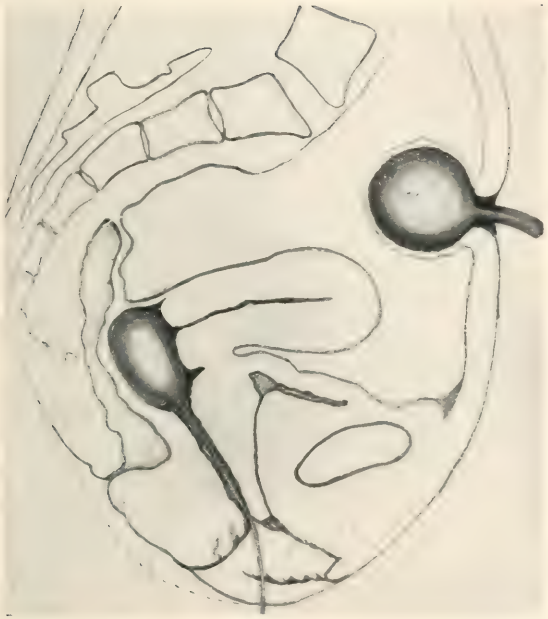

FIG. 1.—When testing intra-abdominal pressure the collapsed bag was put within the inverted sac of suitable postoperative or other hernias free from obstructive adhesions.

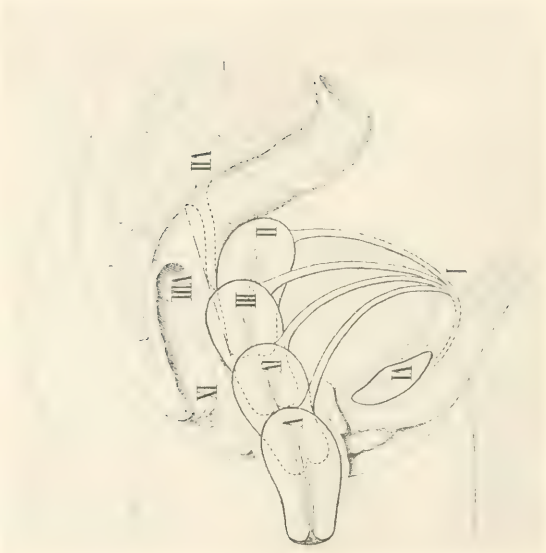

Fig. 1 plus.—The uterus in backward and downward displacement describes an arc, the radius of which is represented by the round ligaments, and the radius of an arc is constant. Their function is to hold the fundus forward and to maintain its even balance in the pelvis.

Fig. 2.—The inferior uteropelvic ligaments, being attached to the side of the cervicocorporeal junction and walls of the pelvis above the obturator muscle and lying in the plane of the broad ligaments, exert an upward and lateral traction and have a tendency to prevent downward and backward motion of the uterus in the direction of its long axis. They do not act as aids to the uterosacrals in holding the cervix in the posterior section of the pelvis except as counter-tractors. See also Fig. 2 plus.

FIG. 2 plus.—The uteropelvic ligaments do not hold the neck in the hollow of the sacrum as claimed by some authors, on account of the relations here described, or if the lateral traction is sufficient to exert such an influence it is so limited that very slight relaxation of them will permit the lower segment of the uterus to advance to the vaginal orifice.

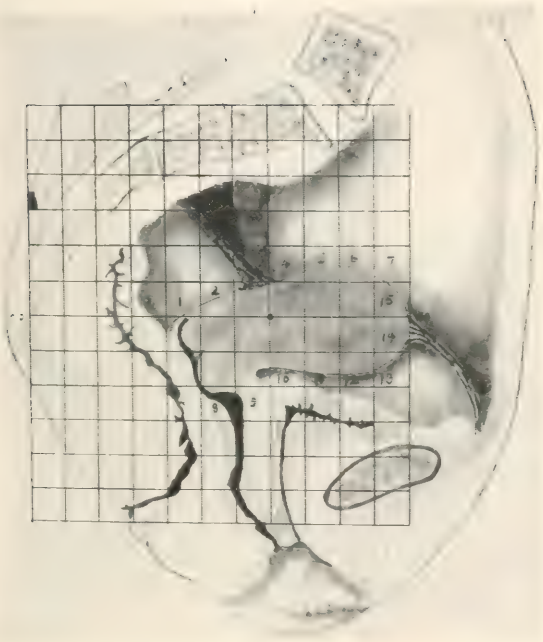

FIG. 4.—Parts of the uterus exposed to pressure coincide with its peritoneal coverings. Its area on the lower pole is represented by units 1, 2, and parts of 0 and 3, while 4, 5, 6, 7 stand for the upper pole, there being one unit excess on the latter.

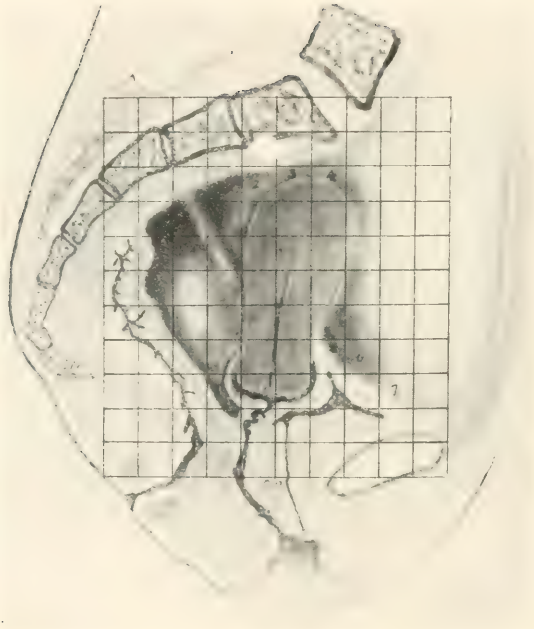

FIG. 5.—Added to this is the strain of abdominal pressure as indicated by all the units in contact with the peritoneum of the bladder, uterus, and Douglas' pouch (1, 2, 3, 4, 5, 6, and 7). The cumulative effect of these is an overburden far in excess of the normal 25 per cent.

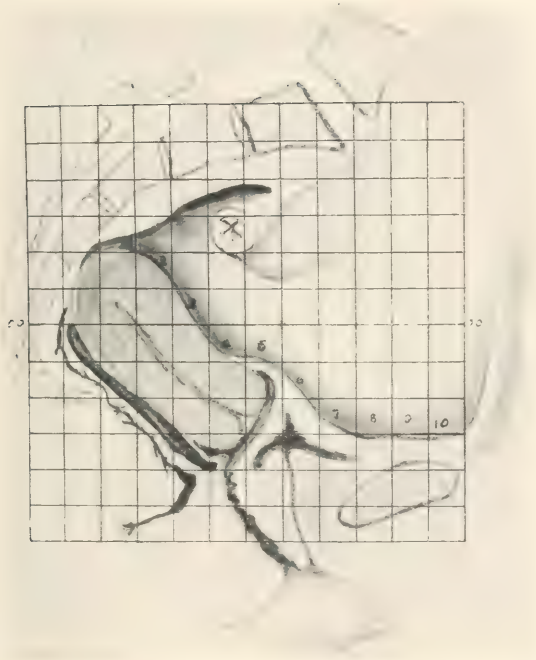

Fig. 6.—This diagram exhibits the retroverted uterus. In this position the units (1, 2, 3, 4, 5, 6, 7, 8, and 9) cover the entire pelvic peritoneum and indicate that the pelvic organs are subjected to the maximum strain originating in the abdomen. This strain is augmented in the erect position by gravitation.

etc. The false bottom is formed by the reflected sheets of the rectovesical and deep pelvic which support the bladder, uterus, and rectum, and contribute to the component parts of certain ligaments of the pelvic organs.

The structures entering into the formation of the pelvic floor are designated as the buoyant supports, while the false bottom in connection with the ligaments is the suspensory support of the pelvic organs. Nature in this way has made double protection against the stress of intra-abdominal strain, and provided for its gradual dispersion to the side walls and floor of the pelvis, thus eliminating the shock of sudden contact with unyielding surfaces and liability to laceration of ligaments, peritoneum, etc., that might occur under the influence of violence. With these, this paper will deal briefly, attention being confined principally to the ligaments of the uterus.

Deaver describes them as being of two kinds, false and true. The first are peritoneal folds, so well known that they need not be mentioned here. The latter, the round, utero-pelvic and the uterosacral ligaments, are made up of fibrous and muscular tissue, and on that account concern us most.

They are unstriped muscular prolongations from the uterus, therefore are affected and behave in a manner not unlike the uterine muscularis. They become softened and relaxed in similar circumstances, and suffer the effects of puerperal infection when it extends to the peritoneum or parametrium. They may even become thickened or hypertrophied in pregnancy and in chronic inflammatory (vascular) conditions of the cervix, such as carcinoma, and be mistaken for an extension of the disease.

In health the muscle lends elasticity to the ligaments, not the contractility that is characteristic of voluntary muscle but resiliency. It contributes to motion and rebounds and assists in controlling physiological mobility of the uterus. But one of its main uses is capability of hypertrophy

and participation in bearing the increasing weight in the early months of pregnancy.

These ligaments in pairs possess individual functions. The round ligaments running from the cornua upward, outward, and forward to the inguinal canal are so placed that they cannot effect a sustaining influence upon the uterus in the normal position, nor are they put upon severe strain until the cervix protrudes from the vagina, for the uterus in its backward and downward displacement describes an arc, the radius of which is represented by this pair of ligaments and the radius of an arc is constant (Fig. 1 plus). Their function is to hold the fundus forward and to maintain its even balance in the pelvis.

But when imperfectly developed, relaxed, or elongated they fail in this specific function; then from the effect of posture or excessive distention of the bladder, etc., retroflexion occurs.

The superior uteropelvic ligaments, extending from a point below the attachment of the Fallopian tubes to the uterus outward to the lateral walls of the pelvis, possess a limited range of utility. They are extremely small, and from their points of attachment and from the naturally relaxed state of the upper border of the broad ligaments, can take no part in directly holding up the pelvic organs. Like the round ligaments they act as guys to the top of the womb.

The inferior uteropelvic ligaments, being attached to the side of the cervicocorporeal junction and walls of the pelvis above the obturator muscle and lying in the plane of the broad ligaments (Fig. 2), exert an upward, forward and lateral traction, and have a tendency to prevent downward and backward motion of the uterus in the direction of its long axis. They do not act as aids to the uterosacrals in holding the cervix in the posterior section of the pelvis except as counter-tractors (Fig. 2 plus).

A line passing along one of these muscles, through the cervix and up to the other would be angled at the point where it traverses the neck of the uterus. The cervix, therefore, may be said to be sitting in a swing formed by these two bands of muscular tissue, and, so far as their control is concerned, might swing back and forth with little restraint. They do not hold the neck in the hollow of the sacrum as claimed by some authors, on account of the relations here described, or if the lateral traction is sufficient to exert such an influence it is so limited that very slight relaxation of them will permit the lower segment of the uterus to advance to the vaginal orifice.

Anatomists with few exceptions describe the uterosacral ligaments in common, and agree that they are flat, muscular bands extending from the junction of the body and cervix of the uterus to the articulation of the second and third sacral bones or to the sacrum opposite the lower border of the sacroiliac joint.

"The muscular fibers which run in the uterosacral ligaments are more or less continuous, not only with the fibers of the uterus, but with the muscular fibers about the region where the ureters enter. There are also muscular bundles running from the sides of the bladder—below where the ureter enters—to the vagina, and again from the vagina to the walls of the rectum" (McKay, p. 223).

Motion imparted to the uterus by superimposed force puts these bands upon a strain in the direction of their longest dimensions. The neck of the uterus cannot move forward without relaxation, or unless the pressure is sufficient to stretch them. They, therefore, limit motion of the lower pole of the uterus and maintain it in a more or less fixed position in the posterior part of the pelvis. They preserve the balance and equalize the strain in front and behind the uterus, maintain the normal size of Douglas' pouch, and help to turn the body and fundus of the uterus forward

in such a way that intra-abdominal pressure is exerted upon its posterior surface with a tendency to antevert the organ.

The principal parts of the buoyant supports or pelvic floor are the levator ani muscle (including the coccygeus), the rectovesical and deep pelvic fasciæ, the triangular ligaments, and the coccyx.

The periphery of the levator muscle, being attached to the sides of the pelvis and its central portion to the coccyx, is deeply concaved, and resembles a bowl with its rim tilted forward and upward, the plane of which cuts the horizon at an angle of about forty-five degrees. The central portion of its concaved bottom is behind the anus; the bowl-like muscle, therefore is represented as lying upon its side, through which the rectum and vagina pass. These two canals incline upward and backward at sharp angles to the side of the muscular bowl, and lie directly upon its inner surface. The uterus and the bladder rest upon both of them. The uterus, inclined as here described, lies nearly parallel to the pubo-rectal portion of the muscle and quite parallel to the external margins of the vaginal orifice. Its anterior surface is then presented to the sides of this muscular bowl and the vaginal outlet.

Under excessive strain it would be driven down upon the bladder and vagina, and in turn would force them upon the levator muscle and to the vaginal introitus, covering the latter with its broadest dimensions, and not with its wedge-like extremity (the cervix) and effectually blocks its own expulsion. The pelvic floor is so constructed that it becomes the greatest support of the pelvic viscera, taking 75 per cent. of the strain.

Having set up the principles of force and resistance, the physical features involved now require attention.

Pressure contained within a cavity exerts its influence in all directions equally, and can be no greater than the weakest point of the container for it seeks the direction of least

resistance. If a ball be placed in a closed cylinder surrounded with water or other fluid, and subjected to pressure, the force will be distributed equally over the surface of the ball.

If, in place of the water, the ball be surrounded by numerous rubber bags or tubes containing water and air the effect will be the same. If, in place of the ball, the uterus be substituted, the pressure within the container would be expended upon it in identically the same way. Further, if the closed cylinder be substituted by the abdominal and pelvic cavities, and the intestines be represented as taking the place of the rubber tubes, it will be apparent that the effect of pressure within the abdominal cavity is not unlike that exerted upon the ball in the cylinder; that is, an equal distribution of pressure above, behind, and in front of the uterus or upon all of its exposed parts (Fig. 3).[1]

If the pelvic supports were absolutely rigid, it would be contrary to any known law of physics for intra-abdominal pressure to disturb the position of the uterus. But, as such is not the case, and since it has been shown that abdominal dynamics do influence the pelvic organs, some change in the position or relation of the structures below and external to the pelvic peritoneum must take place before this force can alter the balance of the uterus.

Then, as the tendency of abdominal pressure is to drive the pelvic organs and floor of the pelvis directly before it, the weaker parts become the most impressed while the more fixed tissues suffer the least displacement.

In changing conditions, the surface of the uterus exposed to pressure varies, which circumstances necessitates a comparison of the dynamic influence on different parts of that organ. This we can do by relative expressions only, on account of inability accurately to measure the surface

[1] This was illustrated by an adjustable picture too complicated to print.

of the pelvic peritoneum, and accordingly a system of units has been adopted to take the place of customary notations in pounds, ounces, etc.

In this matter effects must be reckoned with respect to the centre around which the uterus rotates in backward and downward displacements. It is located near the internal os at the attachment of the uterosacral ligaments, its axis lies transversely in the base of the broad ligaments. I have called it the pivotal point.

As the uterus is balanced on this point, by reason of its posterior ligamentous attachments, comparison of pressure upon its lower and upper poles must be made with this centre as a line of demarkation between the two extremities.

Parts of the uterus exposed to pressure coincide with its peritoneal coverings. Its area on the lower pole is represented by units 1, 2, and parts of 0 and 3, while 4, 5, 6, 7 (Fig. 4) stand for the upper pole, there being one unit excess on the latter. It is the longest, and its forward tilting has been described as a lever-like action. This action is much increased when the superior borders of the broad ligaments are sufficiently relaxed to let the corpus uteri lie upon the bladder, for the pressure area of these ligaments is greater behind than in front; stress, therefore, would force the body of the uterus and bladder against the levator muscle and over the vaginal orifice.

But when the bladder is distended or when intestines lie between it and the uterus, abdominal pressure is transmitted through them to the anterior part of the uterus; thus the four units 10, 11, 12, and 13 (exerting a lifting effect) neutralize units 4, 5, 6, and 7 behind the corpus. The lever-like action is reversed, for pressure in the cul-de-sac, 1, 2, and parts of 0 and 3, carries the lower pole forward and the upper pole moves to the rear.

This clearly indicates the use of the round ligaments, for without them to hold the fundus in position the difference

of pressure favoring forward inclination of the uterus might be easily overcome.[1]

Inspection of Fig. 5 discloses the fact that, no longer occupying the anterior segment of the pelvis, the uterus is not subject to forcible displacement against the bladder and levator ani muscle, nor of imparting to the pelvic floor 75 per cent. of incumbent stress, but that its own weight rests upon the broad, uteropelvic, and uterosacral ligaments. Added to this, is the strain of abdominal pressure as indicated by all the units in contact with the peritoneum of the bladder, uterus, and Douglass' pouch (1, 2, 3, 4, 5, 6, and 7). The cumulative effect of these is an overburden far in excess of the normal 25 per cent

The testing-bag shows in place of 20 mm. of pressure being sustained by the ligaments, that almost the full amount of intra-abdominal pressure is registered in the upper extremity of the vagina.

The base of the broad ligaments being no longer restrained by the presence of the corpus uteri between it and the pubic bone, swing forward and divert the greater strain to the uterosacral ligaments.

With forward movement of these ligaments there is an increase in the area of the pouch of Douglass, and a consequent increase of pressure. The larger the pouch grows, the greater the force behind the uterus; the increased number of pressure units behind the cervix drive it forward, the inferior uteropelvic ligaments pull the lower pole forward, the posterior ligaments give way, the pivotal point moves downward and advances to a position anterior to the centre of gravity of the uterus. Pressure units in front and behind

[1] It also explains the reason girls and young women with immature development or slight infantilism are so frequently subjected to retrodisplacement. And I may add that the lack of development in the body of the uterus results in decrease of pressure area behind the corpus and coincidentally a relative increase of pressure-bearing surface in pouch of Douglas, or a reversal of normal status.

the body neutralize each other, and the balance of the uterus being thus disturbed it next assumes the position of retroversion.

Fig. 6 exhibits the retroverted uterus. In this position the units (1, 2, 3, 4, 5, 6, 7, 8, and 9) cover the entire pelvic peritoneum and indicate that the pelvic organs are subjected to the maximum strain originating in the abdomen. This strain is augmented in the erect position by gravitation. The uterus is in the axis of the vagina (between fifty and sixty degrees to the horizon), and prone to slip almost directly downward.

Conditions are now changed, the uterus no longer produces the ball valve action over the vaginal orifice, the pressure-bearing area behind the base of the ligaments is no longer counterbalanced by that anterior to it; but the combined force of the two sections represented by the units or the entire pelvic area is applied directly to the bladder and anterior surface of the uterus as it lies in the hollow of the sacrum.

Change in the tissue, such as softening from relaxation and venous stasis, interfere with nutrition and decrease resistance. The conditions are similar to those of the post-puerperal displacement except for the effect produced by infection, inflammatory lesions, lacerations, etc.

The mucosa, connective-tissue, and fascia become edematous; glandular secretions increased, infection is invited; the result is disease of the endometrium, glandular proliferation, round-cell infiltration, and hypertrophy of mucosa, or perhaps chronic metritis, fibrous deposit, atheromatous vessels, hemorrhage, etc. The vagina becomes redundant and thrown into folds, the anterior wall slips down in advance of the uterus and, forcing up the trigonum, passes beneath it into the ostium vaginæ, the latteral ligaments of the bladder become relaxed and if the suspensory ligaments are much impaired the neck of the bladder may rotate under the

pubic arch in advance of the developing cystocele. The uterus becomes prolapsed, the uterosacral ligaments effaced, and the broad ligaments are subjected to excessive pressure. The inferior uteropelvic ligaments are now subjected to greatest strain and the round ligaments can offer no restraint until extrusion of the cervix occurs.

At this stage the restraining force preventing extrusion devolves upon the overstretched broad ligaments and the peritoneum and with little effect, for the full force of intra-abdominal pressure is measured at the vaginal orifice.

The posterior vaginal walls coincidentally with the anterior drops for a short distance, but is retarded by its attachments to the rectum, and indirectly by its lateral ligaments when they reach a line between the ischial spines. In this new location they become tense and not being subjected to much pressure act as a check on the descent of this part of the vagina. But on further advance, these attachments feel abdominal strain, and follow the uterus in its outward passage.

So much for the effects of pressure upon the ligaments of the uterus in ordinary circumstances, but now let us turn to the consideration of cases having their beginning in lesions of the floor of the pelvis.

The perineum may be likened to the centre stone in an inverted arch, but in the place of the crushing force, it sustains a tensile strain. The decussating fibers of the levator ani muscle attached to the anterior surface of the anal segment of the rectum, the rectovesical fascia, and the triangular ligament (constituting the most important parts of the perineum) act as a bond holding the two halves of the levator ani muscle together between the rectal and vaginal outlets. Pressure tests show an average of 80 mm. in the abdominal cavity, 60 mm. beneath the cervix, 40 mm. on the inside of the perineum and 20 mm. on its external surface before it reaches full distention, and zero when bulging

is complete. Therefore, it will be observed that the perineum must sustain 40 mm. of pressure, and actually bears two-thirds of the burden measured beneath the cervix, or 50 per cent. of abdominal strain. *But when the perineum is destroyed pressure tests show full intra-abdominal strain at the vaginal orifice.* The reason for this is that the two sides of the levator muscles separate, the abnormally large vaginal orifice offers no resistance, and the pelvic organs are held by their ligaments and other suspensory attachments only (the support below being removed). Normally the levator muscles draw the perineum forward and beneath the bladder until the posterior commissure reaches the trigonum, which covers the outlet like a lid to a box. In lacerations of the perineum this effect is lost. The loose portion of the vesicovaginal septum posterior to the trigonum (that part in which the connective-tissue permits the bladder to move easily on the vagina) slips forward, and, becoming more or less edematous, passes beneath the trigonum, and protrudes from the vagina. As it develops, it draws the neck of the bladder and the uterus downward. If the rectal sheath has been torn when subjected to elongation, coincidentally with distention of the perineum in labor, or if meshing of its fibers has occurred, the rectum rolls forward and outward for the lack of perineal support, the thin walls of the rectum being unable to sustain the intrarectal pressure which at times is equal to the abdominal. When dealing with lacerations we must not be unmindful that they are frequently associated with puerperal infection. Inflammatory softening is not confined to the uterus, but it involves the ligaments and arrests the process of involution; they become relaxed and incapable of supporting the uterus. It lies in the hollow of the sacrum, consequently this class of cases frequently begin with retroversion. They, however, follow a similar course to those described except that changes take place more rapidly, and, there being a greater relaxation

of fascia, the rectum is disposed to slip forward in advance of the cystocele.

I might add that there are exceptions to the general rule in regard to the causes of displacement of the pelvic organs, but it is not the purpose of this paper to deal with cases having their origin in new growths and other specific pathological lesions, nor is it intended to account for the influence of adhesions to the uterus, etc.

NOTES ON VESICO-UTERINE TRANSPOSITION

By Thomas J. Watkins, M.D.
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My experience with the operation of vesico-uterine transposition for cystocele and uterine prolapse dates from January 28, 1898,[1] since which time approximately 275 cases have been operated. Difficulties which have been encountered in an effort to follow these patients make impossible a satisfactory report on the present condition of more than 104 cases. There has been no recurrence of cystocele in any of the cases. Thirteen of the patients have had some recurrence of the uterine prolapse. This recurrence has consisted in protrusion of the fundus uteri or of the cervix. In two cases where the uterus was senile and very small the fundus and cervix have appeared at the vulvar orifice. These partial failures are almost always due to faulty judgment at the time of operation, and can be remedied by a minor secondary operation. Necessary modifications in technique to meet the requirements of individual cases will now be considered under important features in technique and excision of parts of the uterus.

Important Features in Technique. 1. *Blunt Dissection with Scissors.* Blunt dissection with scissors is of much service in separating the vaginal mucosa from the bladder and the bladder from the cervix as well as in separation of the vaginal mucosa from the rectum in perform-

[1] Amer. Gyn. and Obs. Jour., 1899.

ing perineorrhaphy. With a little care the plane of fascia between these structures is easily found, and thereafter the dissection, is readily done in tissues almost free from hemorrhage. In case difficulty is encountered in finding the plane of fascia a short longitudinal incision will expose it.

2. *The Transverse Incision.* The transverse incision in front of the cervix should be freely made to facilitate delivery of the uterus and favor free backward and upward replacement of the cervix when the fundus is anteverted. All bleeding vessels should be ligated at this time, as they are not easily accessible after delivery of the body.

3. *Incision of the Peritoneum.* After the bladder has been separated from the cervix by blunt dissection a long, narrow retractor is inserted to elevate the cervix and expose the peritoneun. The vesico-uterine fold of peritoneum is now readily grasped with tissue forceps and incised.

4. *Delivery of the Body of the Uterus.* In delivering the uterus the fundus should be brought out first, as the diameters of the fundus are much less than of the anterior wall of the uterus. If the uterus is very large or the case is complicated by fibroids or disease of the adnexa, median longitudinal section through the anterior wall of the cervix and lower uterine segment will facilitate incision of the peritoneum and delivery of the body of the uterus.

5. *Excision of Parts of the Vaginal Flaps.* The hypertrophied mucous membrane that is frequently found near the urethra should be sufficiently excised to prevent subsequent protrusion. Enough of the vaginal flaps should be excised to dispose of redundant tissue, but enough must be left to allow approximation without tension. The anterior lip of the cervix is now amputated.

6. *The Suture.* The first suture should be so placed that the hernial opening of the bladder will be obliterated by the transposed uterus. If a urethrocele is present the suture should be passed through the vaginal flaps so that when

tied it will draw and hold the urethra in its normal location. Before tying the first suture the uterus is reposited sufficiently to avoid strangulation. Careful observation will show the presence of considerable submucous connective tissue, which if included in the suture adds another layer to the already firm wound surface. Inclusion of the uterine or cervical tissue in each vaginal stitch, as suggested by Wertheim,[1] materially lessens the danger of a recurrent prolapse. The transverse vaginal incision should usually be closed longitudinally to lengthen the anterior vaginal wall. A complete circular incision about the cervix, as advocated in my original paper, will permit insertion of the suture so as to further displace the cervix upward and backward, and is useful when the vagina has become much shortened. Complete hemostasis is essential; low-grade infection by vaginal bacteria follows any considerable retention of wound secretion.

7. *Perineorrhaphy.* The ultimate success of the entire operation depends largely upon how efficiently the perineum is repaired. The perineal repair should extend to the upper border of the levator ani, and should include as much of the pubic portion of this muscle as is possible without too much tension upon the sutures or excessive narrowing of the vagina.

Modified Technique. 1. *Excision of Part of the Body of the Uterus.* This should be done whenever the uterus is very large. The excised portion should consist mostly of the anterior uterine wall and in certain cases should include some of the fundus. Enough of the posterior uterine wall should be left to close the hernial opening through which the bladder protrudes. The length of the remaining portion of the uterus should be sufficient to prevent traction upon the cervix and shortening of the vaginal canal when the wound is closed.

[1] Archiv f. Gyn., 1914, Bd. 102, p. 201.

2. *Amputation of the Cervix.* This should be done when the cervix is much hypertrophied, and especially when very long and protruding through the vaginal orifice.

3. *Excision of the Entire Uterine Mucosa.* In cases where much of the uterine body or cervix is excised, the operative technique is simplified by excision of the entire uterine mucosa. Most of the cervical tissue can easily be excised and then the closure of the wound will materially shorten the broad ligaments. After the mucosa is excised, the uterine and vaginal wounds are very satisfactorily closed by one tier of figure-of-eight sutures.

After-care. Many of the cases require the use of a catheter for two or three days, and occasionally as long as they are confined to bed. Early getting up in these cases is advisable. Elevation of temperature sometimes results. In these cases the head of the bed is elevated and moist dressings are kept over the vulva. The fever disappears soon after the escape of some decomposed serosanguineous discharge.

A considerable number of cases have some vesical irritation for two or three weeks. In only one instance has this bladder disturbance continued. The complication may be the result of catheter cystitis, but is usually a continuation of the vesical symptoms that antedated the operative treatment.

Conclusions. 1. Vesico-uterine transposition should be made before much protrusion through the vaginal orifice results, as the prolapse rapidly increases after this takes place; the more the prolapse, the greater the dangers of recnrrences following the operation.

2. Vesico-uterine transposition cures cystocele, the most important pathological feature.

3. An occasional recurrence of the uterine prolapse will occur, except in cases where the vaginal canal can be

practically obliterated. This recurrence, however, is not serious, as it is easily remedied.

4. The operative technique should be adapted to each individual case.

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A STUDY OF THE END-RESULTS OF INTERPOSITION OF THE UTERUS

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Of the many operations which have been suggested and performed for the cure of prolapse of the uterus, descent of the vaginal walls and the accompanying vesical hernia, none, unless it is that described by Baldwin, in his thesis for entrance to this Society in 1912, have given us such satisfactory results, as those obtained from interposition or transposition of the uterus, when the indications for this procedure have been properly selected.

The Watkin's operation, as described by Thomas J. Watkins of Chicago, differs in many ways from the technique employed by Schanta, Wertheim, and others, possessing a refinement of gynecological technique, indigenous to American surgery. The foreigner has as yet but a vague conception of plastic surgery, especially of *pelvic plastics*, neither does he take into consideration the weight or size of the uterus he is about to interpose, nor the type of prolapse he is dealing with, which perhaps explains the failures so often reported.

The normal supports of the uterus may be enumerated as follows:

1. The uterine ligaments, especially the *uteropelvic* and *uterosacral*, which maintain the cervix in its normal position.

2. The pelvic floor and pelvic fascia, which make the pelvic diaphragm.

3. The supporting action of the adjacent pelvic organs.

4. The action of the intra-abdominal pressure.

And finally, the axial relation of the uterus to the vagina.

The basic principle of maintaining the uterus in position is the retention of the cervix well back in the hollow of the sacrum, while the fundus rests on the pubic shelf. This depends largely on the upward and backward traction of the utero-sacral ligaments, the integrity of the fascial sheets, and the upward supporting action of the pelvic floor.

The Types of Prolapse. Decensus is properly a *general intrapelvic hernia.* Descent of the uterus is always attended by more or less inversion of the vaginal walls, and always takes place along certain cleavage planes, as for instance, the tissues may slip their (1) *postpubic attachments* and allow the *anterior segment of Hart,* including the bladder, urethra and anterior vaginal wall to prolapse through the vulva introitus, or the original injury may be through the (2) *vesical plate of fascia,* allowing a hernial protrusion of the bladder (cystocele) or to be due to a laceration through the (3) *rectovaginal sheet and the levatores ani,* with consequent *rectocele,* or rectal prolapse, especially when the anal fascia has been included in the injury.

Enteroptosis and an increase in intra-abdominal pressure are factors which persist long after any operation is done for prolapse of the uterus and therefore are potent causes of relapse. It must not be lost sight of however, that descensus uteri does occur in women who have never borne children, or who have never sustained sexual relations. In procidentia the vagina becomes thickened, edematous and the epithelia become dry and horny, owing to the fact, that the inverted vagina is the seat of a chronic venous stasis and is no longer moistened by the cervical secretion.

The continued venous stasis produces permanent tissue changes in the infravaginal portion of the cervix and in the vaginal walls, causing the cervix as a whole to be greatly elongated and thickened. The body is likewise enlarged, the bladder is prolapsed and shows the morbid changes chronic catarrhal inflammation of the mucosa and of inflammation of the *muscular coat.*

In the operative cure, therefore, we should take into consideration, a study of the *types of prolapse to be dealt with,* for an operation which is applicable to one type fails in another. Each case should be studied as to the *cleavage plane of its descent,* the size of the uterine body, the amount of *infra- or supravaginal hypertrophy of the cervix, the extent of the vaginal inversion,* the degree of the cystocele and rectocele, including the edema and general condition of the vaginal walls, the presence or absence of adhesions, adnexal tumors, etc., the degree of visceral ptosis, and intra-abdominal pressure, should also have consideration, and finally, every patient with pelvic prolapse should be examined in the standing posture.

Interposition or *transposition* of the uterus may be elected in women past or near the menopause, where the uterine body is small, or can be sufficiently reduced in size, and is not diseased by degenerative changes, and when the hypertrophy of the cervix is infravaginal and the *cystocele is the chief complicating lesion, provided the prolapse has not occurred at the postpubic cleavage plane.* This may be determined by the position of the urethra and a test of its attachment to the pubis.

The technique employed in our clinic consists:

1. In a high amputation of the cervix, except when the uterus is atrophic.

2. In a longitudinal incision through the anterior vaginal wall from just behind the meatus to the cervix, each lateral flap is grasped by a ring forceps and the bladder stripped

off from its attachment to the vaginal wall in the line of cleavage, by blunt dissection.

The separation of the bladder from its anterior, lateral and posterior attachments, and control of all hemorrhage by clamp and ligature, are the most important steps in this operation. The bladder is next retracted and separated from the anterior uterine wall, and the front of the broad ligaments, when the vesico-uterine fold of peritoneum bulges into space between the uterus and bladder, where it is incised and the blade of the retractor inserted into the peritoneal cavity, holding the bladder upward and forward. This allows the operator to climb up the anterior face of the uterus with traction hooks and *antevert the uterus* under the bladder. The adnexa are now thoroughly explored and given such surgical attention as may be needed, or if the woman is still of the child-bearing age, the tubes may be tied with fine silk and excised. With the fundus drawn well forward into forced anteversion, the anterior fold of of peritoneum, making the vesico-uterine pouch is sewed to the posterior surface of the uterus just above the internal os; this makes the uterus extraperitoneal.

Two chromic gut sutures are now passed from the lateral vaginal wall on one side, just posterior to the meatus, through the anterior wall of the uterus, below the level of the round-ligament insertion and out through the lateral vaginal wall on the opposite side. The ends of these two sutures are clamped, drawn taut, and held up by an assistant, while the fascial layer of the anterior vaginal wall is united by a continuous suture of iodized catgut.

The mucosa is finally *closed with a series of interrupted sutures of chromic gut, so as not to shorten the length of the anterior vaginal wall.* Before the catgut sutures are tied, the mucosa posterior and to each side of the cervix is denuded and a silkworm-gut suture is passed through the area including the base of the broad ligament, across the front

of the uterus and out through the base of the broad ligament of the opposite side. This when tied lifts the cervix upward and backward, in the manner suggested by Baldwin in his plication of the anterior vaginal wall. A high perineorrhapy completes the operation.

The Causes of Morbidity. In our early experience there was a considerable morbidity from this operation, which was largely due to our inexperience with the technique. One of the most troublesome causes of morbidity was the difficulty in securing *perfect hemostasis*, resulting from the wide lateral separation of the bladder, extending into the venous plexuses, just behind the pubic rami; hemorrhage at this point is extremely difficult to control, and if not perfectly controlled, results in an intraligamentous hematoma, which is very liable to become infected. Several of our cases developed a lateral parametritis and in one the uterus was embedded in a postoperative blood clot exudate for many months.

Injury to the Bladder. The bladder is liable to be *injured* in separating it from the anterior uterine wall, unless the uterovesical ligament is located and cut early in the dissection. If this is done it is possible to separate this viscus from the uterus and front of the broad ligaments without difficulty. Fistulæ at this point heal readily when immediately sutured, and the bladder is drained with a permanent catheter.

Vesical disturbances are not uncommon following interposition, these are partly due to displacement of the bladder and the relation of the uterine fundus to the vesical neck, and partly the result of catheterization, necessitated by the vesical spasm, consequent upon the irritation of the perineal sutures. Collicystitis, trachelocystitis, and trigonitis have produced a train of annoying symptoms.

The extreme anteversion of the body has occasionally produced an angulation of the uterine canal, especially

when amputation of the cervix has been omitted, with resulting hematometra. This complication has occurred in two women past the menopause, in whom the uterus was atrophied, and the cervix of a senile type. Such a uterus is normally retroverted and when the body is brought forward and fastened to the vaginal plate under the bladder, unless the cervix has been amputated, the sound shows *antiflexion*, not *anteversion*, and adhesions of the endometrium are likely to occur at the point of flexion and cause a retention of the normal secretion, with dilation of the uterine cavity. In our later cases, we have met this by bringing the base of the broad ligaments in front of the short atrophic cervix, and thus carrying it upward in the pelvis, which results in a straight anteverted uterus. Pyletitis has followed this operation as an immediate post-operative complication. The colon bacillus has been the causative factor. Injury to the vesical circulation makes the bladder more susceptible to infection, residual urine is retained and ascending infection takes place. Proper preliminary preparation of the patient has, in our later cases, prevented this lesion. Preoperative tissue depletion for the reduction of edema by the employment of posture, douches and glyceride tamponades, etc., do much toward minimizing the venous oozing which takes place during the separation of the bladder.

Eighty-two cases individually studied, make the basis of this report. All of these women were at or near the menopause at the time of operation, except four, who were in the active child-bearing period; and all, save these four who were operated while still menstruating regularly, were sterilized by *ligation* of the tubes with *silk and excision and suture of the uterine end of the tube.* These four had had very *difficult previous labors*, yet did not wish to be sterilized, preferring to elect section in case of subsequent pregnancy, than go through future infrapelvic deliveries.

Two postoperative deaths are recorded; one from acute uremia, the other from septic infection of an intraligamentous hematoma. In all the pelvic floor was restored by a high levator myorrhaphy.

Five cases show a recurrence of the prolapse, the fundus having fallen forward through the vulvovaginal introitis, owing to stretching of the anterior vaginal wall. These patients should never have been subjected to this operation, they were errors of judgment for the following reasons: In one the uterus was too small and senile to act as a supporting bridge; in two the fundus was too large and heavy to be held in position by the atrophied fascia of the vaginal plate; in the other two the vaginal inversion was too great to be properly remedied by this operation especially, as the prolapse had originally occurred in the *postpubic cleavage plane*, hence the urethral and periurethral structures, including the apex of the triangular ligament afforded *no pubic shelf* on which the anteverted fundus *could lie*. All five of these women should have been subjected to a *hysterocolpectomy*. Sixty not only have an anatomical cure, but are free from all symptoms referable to the pelvis. Nine others have anatomical cures but are annoyed by pelvic symptoms, referable to the bladder, lower abdomen, or vagina.

The large majority of these patients have been cystoscoped at some time subsequent to this operation, and a constant cystoscopic picture has been revealed, *i.e.*, there has been some infolding of the bladder base, the trigone being elevated and injected above the lateral portions of the base. Trigonitis has been present and producing some vesical irritation in nearly one-half of my cases. Instillation of 25 per cent. argyrol solution has given relief in nearly all. The vesical irritability has been intractable in only three, and in these we have produced temporary relief by the topical application of strong silver nitrate solutions to the ulcerative areas in the trigone.

Two, in whom the anatomic and symptomatic result would be considered as satisfactory, have had intermittent attacks of uterine distention from accumulated secretion behind an angulated cervix; these cases were referred to under possible complications.

Four are, or have been, pregnant. Of this number one miscarried at the third month without complication. One is now at the seventh month of pregnancy and presents the following anatomic relations: The cervix is high and well back in the hollow of the sacrum, the anterior uterine wall is still attached to the vagina, but not dragging it up, and is distinctly thickened, while the development of the gestation seems to be going on in the posterior wall and upper segment without symptomatic disturbance. The bladder seems to have adjusted itself to its new position. Unfortunately, this woman will not be confined until after this report is a matter of record.

The third patient had a grave toxemia of pregnancy and was delivered spontaneously at six and one-half months, this patient had a very stormy pregnancy for six months, suffering from constant pain in the lower abdomen, traction on the vagina and marked dysuria almost from the beginning of her pregnancy.

One has passed through an uneventful pregnancy and was delivered spontaneously of a living child at term. The interesting feature of this labor was that, the head was low in the vagina, actually resting on the pelvic floor from the onset of labor, the lower uterine segment was stretched out over the presenting part, and the internal os was effaced before actual labor pains began. Dilation of the external os and the vaginal introitis were almost simultaneous.

Dyspareunia has figured as a troublesome complaint among these patients. This has been especially annoying in cases in which the entire length of the anterior uterine wall has been attached to the vaginal wall. One patient

has had a persistent metrarrhagia for some months after the operation. A diagnostic curettage showed adenocarcinomatous degeneration of the body and this patient has recently been subjected to a hysterectomy.

Incidentally, I would call attention to the ease with which vaginal hysterectomy can be done after the uterus has been interposed. The operation is virtually an extraperitoneal procedure and the enucleation may be done practically without shock.

The causes of failures have been primarily:

1. Errors in judgment in the selection of cases for this procedure.
2. Errors in technique.
3. Atrophic tissue changes in the reconstructed supporting structures.
4. Unrelieved intra-abdominal pressure acting in conjunction with an abnormally large pelvis, or in a pelvis of faulty inclination.

In the future, causes 1, 2 and 4 *can be avoided,* but the actual supporting power of the reconstructed structures can never be estimated and tissue elasticity differs in different individuals, hence, a small proportion of cases will always relapse, no matter how skilled the operator.

From this brief study, admitting that the number of cases is too small from which to draw any general deductions, I wish to offer for your discussion the following conclusions:

1. That interposition operations should be limited to women at or past the menopause, with a relatively small uterus, and that when the procedure is elected in those still menstruating, sterilization by tubal ligation should be done at the time of operation.
2. That cases of prolapse, in which the sliding takes place in the postpubic cleavage plane, are not corrected by this procedure.

3. That the morbidity is wholly due to technical defects, *i.e.*, improper preparation, imperfect hemostasis, vesical injury, etc.

4. That in anteverting the uterus, the anterior wall of the uterus should rest on the fascial plate *just behind the pubis,* the fundus *should not be brought under the arch, as excessive anterior displacement* not only favors recurrence, but antiflexes the uterus and interferes with drainage.

5. That the curettings from uteri about to be transposed should *always* be examined, as degeneration may occur, and hysterectomy is easy after this operation.

A FURTHER DEVELOPMENT OF AN ORIGINAL TECHNIQUE FOR SEPARATELY UNITING THE FIVE STRUCTURES INJURED IN LACERATIONS OF THE PELVIC FLOOR

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The solution of the problem of successfully restoring the pelvic floor after childbirth to its original condition before injury has been delayed by a lack of careful observation of what happens to that region in labor. The general, though faulty practice of immediate suture has precluded an accurate study of the extent and character of the injuries and of the structures damaged.

The later repairs have been undertaken until recently in this country mainly by specialists without opportunity to study these injuries at all stages, and therefore, without adequate comprehension of them. Fortunately this type of gynecologist is rapidly becoming extinct and is being everywhere replaced by men of broader training. The time therefore, is ripe for solving one of the most important problems that could engage the attention of this Society, for more than half of all the women who consult a physician on account of something peculiar to their sex, do so because of injuries to the birth canal.

It cannot have escaped our notice that there has been of late a widespread dissatisfaction with the older methods of pelvic floor repair. The Hegar and Emmet operations,

the best of the older procedures have been abandoned in the most progressive clinics and an improved substitute for them is being sought. The one most generally adopted is an amplification of Tait's old operation, a transverse incision of the perineum, a dissection of the rectovaginal septum, and a union of the belly of the levators ani muscles. But this operation is faulty in several particulars: it bunches together the bellies of the two muscles in the middle line, without regard to the anatomy of the part; it fails to restore the attachments of the muscles to the pubes and ischia; it does not give adequate support; in fact, sometimes aggravates the original condition; when it does succeed in part, it makes a band across the pelvic outlet that the next labor is sure to tear asunder and the attempt to unite the muscles not infrequently leads to the mistake of uniting the deep transversus perinei, missing the levatores altogether, as is pointed out by Döderlein and Krönig and is amusingly illustrated in the recent book by Hartmann, of Paris, in which there is a picture of this very mistake, evidently not recognized by the author.

For all these reasons this method of pelvic floor repair will not stand the test of time. Something better must be devised.

In attempting to do this, it is a reasonable claim that one should set himself these tasks: to understand the anatomy of the region before injury: to know exactly what happens to the woman when she is injured and to restore each one of the component parts of the pelvic floor to the condition it was in before injury. The first of these lessons must be learned by a clinician from competent anatomists like Waldeyer whose book "Das Becken" is an acknowledged authority. The second can only be learned by a careful study of puerpera at varying periods after parturition. For a number of years in my clinic in the University Hospital of Philadelphia, I have had the recently delivered women

placed upon an operating table in the dorsal gynecological position and anesthetized. This has been done in different series of patients on every day of the puerperium up to the seventh. As a result of this study, embracing hundreds of patients, it is possible to state the following facts in regard to lacerations of the pelvic floor: The pelvic fascia over the levator ani muscle shows a split running parallel with the descending ramus of the pubis: the levator ani is torn loose from its attachment to the pubis and ischium, the injury beginning close to the bone and running downward and inward toward the mid line of the posterior vaginal sulcus: the fascia between the levator and the deep transversus perinei shows a triangular split with the apex above. The deep transversus perinei is torn apart in the middle line and the two halves are retracted so that there is a gap between the ends of an inch or more: the junctions of the two halves of the superficial transversus perinei and of the bulbocavernosis muscles are torn apart if the perineal body is injured as is commonly the case in lacerations of the perineum.

These facts being established, and it only necessary to look at a sufficient number of recently delivered women to establish them, the rest of the problem is easy of solution. Such a denudation of the injured region must be made in secondary operations as to expose all the component anatomical parts, and then these component structures should be united separately at the site of the injury and restored to their original condition. This may be done conveniently by the denudation like the Emmet, or by the old triangular Hegar denudation. But in either case the levator ani must be exposed by cutting through the pelvic fascia, under which it lies. There the belly of this muscle is reattached to the portion arising from the pelvic bones: the deep transversus is brought out of its cavity in which it has retracted and is united in the middle line: the pelvic fascia

between the levator and the deep transversus is united by a two tier running catgut stitch, and finally the perineal body is repaired.

The buried continuous tier catgut suture is used for the levator and the fascia; buried interrupted for the deep transversus and perineal body. The skin of the perineum is finally united over the catgut sutures by Michel's clamps or by No. 3 chromic gut.

DISCUSSION ON THE PAPERS OF DRS. NOBLE, WATKINS, POLAK, AND HIRST

Dr. William E. Studdiford.—I shall have to differ decidedly with Dr. Hirst on the anatomical findings as presented in these drawings. Except in cases of very severe forceps injuries, and I may say in improper forceps injury, or where the forceps have been applied improperly, I do not think I have ever seen a case in which the pubococcygeus muscle was cut or torn, as represented in these drawings and as described in the paper of Dr. Hirst. Some of the high injuries to the vagina, that is, along the anterior wall, may injure the pubococcygeus muscle close to its pubic attachments; but as the pubococcygeus passes down alongside the vagina and enters into the formation of the so-called perineal body the tear usually slides across or down the side of the belly of the levator ani on either one side or the other. It seems to me that rather than consider the transversus perinei as the essential muscle I should again differ with Dr. Hirst as to the size of the transversus perinei. From numbers of dissections, from a study of fresh lacerations, I think the transversus perinei, as a rule, is a very flimsy, poorly developed muscle, that has no special funtion in the maintenance of the pelvic floor. He did not mention the relations of the levator ani to the external sphincter. In my experience this has been probably the most important relation, and it is the destruction of this relation that causes a great deal of the prolapse. The levator goes down at the sides, and here I should differ again with Dr. Noble as to the direction of the fibers, rather than describing it as an inverted bowl; it is more

a V-shape running with the sides somewhat convex inward and supported below by the fatty material of the ischiorectal fossa, and further supported by the pressure of the large gluteal muscles.

In making these repairs of the pelvic floor I should take exception to the statement of Dr. Hirst that denudation is unimportant. To my mind I think it is the most important part of the operation. That is a preliminary step.

With reference to the question of closure, it has been my practice, after having determined the point at which the laceration has occurred, and noting the caruncle on eithr side of the vagina, to put that tissue by a running suture at this point (indicating) or by hooks on a stretch. The incision is made through the mucocutaneous junction, and with a blunt scissors the dissection is made to the sulcus on either side of the vagina, simply stripping the mucous membrane of the vagina free. With the finger in the denuded area and pressure upward the original scars formed by the laceration immeditely come into view. To make a complete repair it seems to me it is necessary to remove all of that scar tissue. The extent of that removal will vary on the two sides of the vagina. In this illustration, instead of placing the forceps at the top of the rectocele, as is advocated in many descriptions of perineal or pelvic floor operations, the forceps should be placed at the remainder of the posterior vaginal wall. In the majority of cases the laceration occurs either on one side or the other, or it may be on both, usually one side being deeper and more extensive than the other, and usually in the midline or a little deviation to one side or the other. We find a healthy and normal vaginal mucous membrane with a little caruncle on the end, which is very essential in cases that are incomplicated by extensive rectocele. That brings up another method of treatment, but in the ordinary lacerations of the pelvic floor, where we hope to restore things to normal, that caruncle should be grasped with forceps and lifted up, and it is easy to denude it on either side, then dissecting out the scar; the minute that is done, cutting out a wedge-shaped piece, so that in the end you get a denudation something in this shape (illustrating), not as regular as that. Instead of having to remove some of the healthy posterior vaginal wall, this tab comes down much farther, it is lifted up so that you can keep that point in about direct relation with

the caruncle on either side, and in the completed operation you have brought this caruncle in relation with the tubes at the sides. In stripping off this tissue it brings you down to the connective tissue and sheath of vagina which is united by interrupted stitches, closing up these sulci as far as the vaginal mucous membrane is concerned. Having opened this point up, you find a bundle of tissue which is larely made up of involuntary muscular fibers which maintain the relation between half of the levator ani and sphincter, and in the majority of cases you find the sphincter, instead of encircling the rectum, has been drawn either to one side or the other. If the laceration is on this side (indicating) the sphincter would be drawn over and in closer relation with this half of the levator ani than here, so that with buried stitches getting out and under the levator it is necessary to bring these two halves of the muscle toward the median line, at the same time getting under the sphincter, and I think the muscles that Dr. Hirst described as pulling out, namely, the transversus perinei, is really a combination of the sphincter and tranversus perinei. The two muscles are so fused in the median line in the ordinary surgical procedure that it is not possible to differentiate them. The sphincter and the two halves of the levator are brought together by two or three stitches, and the two sulci closed with deep silkworm-gut stitches, the skin brought together, at the same time including the two halves of the levator and the sphincter in these outside stitches.

In my hands the results have been, I cannot say, always successful, because that is not true, but in the majority of cases the results have been successful, in that the pelvic floor has stood the test of subsequent labors. Of course, where the laceration has existed for a long time and pronounced rectocele has developed, and the muscles have become atrophied from disuse, then the denudation must be very much higher, and we really have to make an overcorrection of the condition, and restoration is not based on anatomical lines, but on lines that will correct the hernia of the rectum and form a support for the prolapsed vagina and rectal wall.

Dr. I. S. Stone.—I shall confine my remarks very largely to repair of the defects attending procidentia or some of the more serious displacements of the uterus backward, or, in other words, to the paper of Dr. Watkins.

In the first place I wish to call attention to a little point in

technique which I have found advantageous. I always make a longitudinal incision and not a transverse incision at the cervix. In thinking it over I do not see how it is more difficult to separate the bladder in this part of the operation than in vaginal hysterectomy, which was done by preference some years ago. It seems that we have nearly abandoned that method. I have always one or two vessels to tie opposite to the internal os.

Right here I will say that I have had one hemorrhage, which was slowly developed under the flap in the anterior vaginal wall after operation and which caused alarm at the hospital. This was in a hospital in which I seldom operate, and the internes were not familiar with the operation. The woman, however, recovered.

In regard to holding the uterus while the sutures are placed, I take a needle and simply place a temporary suture of different material, such as silkworm gut, inserting it so that the organ is easily held until other sutures are applied.

Another thing, which Dr. Watkins attributed to myself, namely, the use of buried sutures. You can take a very stout, short, curved needle, about one and one-quarter inch long, thread it with chromic catgut, and push it through the fascia immediately under the ramus, about half an inch to the right and left of the meatus, not taking in the vaginal flap at all, but getting a good, stout portion of fascia. I can place the suture with certainty, so that I can hold the two cornua of the uterus forward. We have prevented leakage or incontinence of urine by suturing not only the bladder on top of the uterus, but bringing the fundus well forward against the symphysis, on a level with it, so that the new anterior vaginal wall will be horizontal and not prolapsed.

With regard to small uteri, one of my first cases was a woman of over fifty years of age, with a small atrophic uterus. The operation was done many years ago, and she was living fourteen years after the operation.

In regard to recurrences, there has never been separation of the fundus in the cases with which I am acquainted. I have followed my private patients only. It was impossible to follow the others. The only failure I have had was due to quick absorption of the catgut in the perineum, which allowed the cervix to come into view.

Dr. Edwin B. Cragin.—In regard to the interposition operation for prolapse, I would like to touch on three points. I have done the operation fairly frequently in the last five years, and naturally I am more interested in my partial failure than in my successes. I have had one or two partial failures, and I want to emphasize what seems to me to be the reasons for them. In one the cervix apparently came around a circle and approached the outlet. I think one of the reasons for it was that the cervix was too long and should have been amputated. In the second place it was too much anteflexed and should have been straightened out. It seems to me one of the most important features in this operation tending toward success is to make sure that there is no angle between the cervix and body when you finish the operation—that the cervix points directly backward. To overcome the anteflexion, make sure that your suture goes right through the vaginal wall and the apex of the angle between cervix and body, straighteneing out the anterior wall. A third point I wish to speak of is in regard to doing the operation in the active child-bearing age. So pleased have I been with the operation in cases of marked prolapse that I have subjected a few women to it in the latter part of their child-bearing age. Usually, I believe the thing to do under these circumstances is to sterilize them by section of the tube, but one or two men have refused to have their wives sterilized. The women prefer not to have prolapse recur; they prefer not to have another operation for restoration. One of these women had had a laceration through the sphincter and preferred Cesarean section to a difficult delivery from below with the risk of a secondary operation for repair. A few days ago I performed on her a Cesarean section at term. I will admit that, in the last month of pregnancy she suffered from irritability of the bladder, but she was a neurotic woman; always had pains in the latter part of pregnancy, so that one could not really tell whether the discomforts were due to the operation or to the natural pressure of the pregnant uterus. The abdominal Cesarean section was a simple operation.

The only feature of the operation to which I would call attention is the fact that the incision was made low so as to reach the fundus rather than the posterior uterine wall. As I have said, there was no difficulty about the Cesarean section, and I see no reason why there should be any more dread of Cesarean section following this operation than in cases of ordinary dystocia.

Dr. Seth C. Gordon.—I wish incidentally to touch upon Dr. Hirst's paper more to comment upon the criticism made by Dr. Studdiford. Dr. Studdiford has practically advised the old Emmet operation for laceration of the perineum, and I believe it has never been improved upon. I have never done any other operation than the old Emmet operation, and I believe, when it is properly done, it will fulfil all of the indications that can be fulfilled by any operation made. The great fad today is to do practically Tait's operation, raise up a flap, bring together the muscles of the pelvic floor, drop your flap back and leave it. The old operation that Emmet did was practically a butterfly operation. It consisted of denuding, as Dr. Studdiford has said, very thoroughly and uncovering all the lacerated portions, and then doing the triangular operation, that is, denuding each side, having the flap coming down here (indicating), and then the posterior portion of it covering the anus and muscles, and then beginning and suturing from this point to that (indicating), only bringing the needle down so as to absolutely cover up all muscular tissue. That has been the great trouble in the performance of the Emmet operation. Operators have simply after denuding practically united the mucous membrane. It is simply a skin operation; that is all it amounts to, but with a curved needle you begin at the top, being exceedingly careful in regard to hemostasis, dip down and take in all of the muscular tissue until you have absolutely sutured both sides, then with long sutures you close the muscular portion below, including the principal muscles, the external muscles, so that when you have finished the operation everything has been covered up completely, and practically all the muscles have been united, as you will find when you bring the whole thing together. You cover and close all the muscles that were formerly lacerated. I have never used anything but catgut sutures on the external parts. I never use silkworm gut or chromicized gut, and while I have seen operations done almost everywhere, I have never yet seen anything that would stand the test of labor as well as the old Emmet operation. I see frequently in these days women on whom I operated twenty, twenty-five, and even thirty years ago, who have borne children without any succeeding laceration. One of my old students, who is present, tells me that several years ago he found a case in which he never would have known the woman had ever

borne a child, so that I do not believe you can improve on the old Emmet operation.

Dr. Edward Reynolds.—It seems to me the advocates of the interposition operation talk from mistaken premises. Their argument, as I understand it, is that other operations for prolapse ought to be condemned as failures, and that we should do an operation which confessedly produces an abnormality because it is a successful operation. I have hesitated to speak in opposition to interposition for fear I may be taking too personal a position, but there are many of us who feel that the established operations can be made to yield a practically uniform and permanent series of successes. We all have our personal successes and failures. We all have operations that we do well, and probably most of us have also other operations we do not do so well. For those who cannot attain fairly uniform successes by the established operations it seems to me the interposition operation, with its admitted anatomical abnormality, may be fit surgery for women in the child-bearing age; but I cannot help thinking Dr. Cragin condemns his own operation when he defends it in spite of stating that it may necessitate a subsequent sterilization or Cesarean section in the child-bearing woman, for the reason that many of us think the standard operations can be made to yield on the average permanent successes, with no such risk.

Dr. Philander A. Harris.—Several years ago I presented to this Society the description of an operation which involved an abdominal section for prolapse in women who had passed the child-bearing age. It consisted of pulling the corpus, when it was found to be a healthy normal uterus, and fundus up through the perineum, sewing the perineum around the uterus and fixing it posterior to the fascia. Those who have worked with me began to call it the intramural sequestration and fixation of the uterus without removing any tissue from the patient's body. I did sixty-seven such operations. That method was not entirely lost with the members of the American Gynecological Society. More recently, within two years, the operation has been done in the Rochester clinic as a German operation, although it was some years before that I described the operation. It is a departure from the normal anatomy, but there have been no complications and no deaths from the method. I have done over forty of these operations, and I

would recommend the operation to those who are not satisfied with other methods.

Dr. E. W. Cushing.—I quite agree with what Dr. Reynolds said, but I cannot say it so well. While the interposition operation may be successful, yet it is not a good thing for a woman to have her bladder over her uterus. She was not made that way, and if prolapse can be cured without it, it does not seem altogether fitting. I have been working on prolapse of the uterus since 1887, when August Martin taught me, and I have not found but what these cases can be cured by a good operation, leaving the uterus over the bladder. When you get fascia and bring it together in front of the bladder and build up the perineum far enough it will hold. In a few cases where that would not be sufficient I would open the abdomen and fasten the uterus on to the abdominal wall if necessary, but it is seldom necessary.

In his report on this operation Dr. Polak has drawn the indictment of the whole procedure, and Dr. Cragin has given us an illustration. I would like to know where the bladder remains in these cases of pregnancy. Is it riding up over the child, or is it crowded up in front? Where is it? It does not seem to me necessary to do this operation; if it is really what its name implies and not merely the old operation of vaginofixation of the uterus. I believe that even if the bladder is fastened to the posterior surface of the fundus uteri, it will pull itself back into substantially its normal position. I can get along well enough without interposing the uterus under the bladder and others can do without it if they will exercise the same care in doing anterior colporrhaphy, and in building up the perineum, as they do in performing the interposition operation.

Dr. J. Wesley Bovée.—I have never performed this operation and therefore may justly be called a prejudiced witness. I have never done it because I thought it was an operation in which there was a great deal of mutilation of tissue no longer useful in women who passed the menopause, and was dangerous to the woman even to remedy the defect which heretofore had been successfully remedied by the operations in vogue.

We have heard today evidences of the same trouble which followed ventrosuspension, intended as such, but which resulted in fixation, ventrofixation of the uterus, and vaginal fixation of the uterus, the relegation of which to the dumps was largely

the result of a paper read by the President of the Southern Surgical and Gynecological Association, in which he brought forward cases requiring Cesarean section and other surgical procedures in delivery following ventrosuspension done in the clinic of Dr. Kelly. Today it is proposed, which is one of the features which causes me considerable shock, to sterilize women in the child-bearing period for the sake of curing prolapse of the uterus.

We have no right to sterilize a woman for the sake of such a procedure as this. We can only do it when the organs are diseased beyond redemption. I will say positively, we have no right to sterilize women because they require Cesarean section every time they are pregnant. The older methods of procedure, with proper technique will cure marked cases of prolapse, but there are some which need still further treatment.

If a woman has passed the menopause is is probably a better procedure to remove the uterus entirely, to suture the broad ligaments and uterosacral ligaments together to the anterior vaginal wall, out under the bladder, after the latter has been lifted up, being careful to suture the peritoneal margin between the bladder and uterus to the top of the ligaments so as not to get adhesions at that point.

Another good operation is the Le Fort operation, which is easily performed, and retains the functions of the woman in case she becomes pregnant. I have never done it during the child-bearing period. The septum can be divided for the sake of delivery if necessary, but all these operations are ample and reliable, and I am perfectly satisfied in my own work with the old procedures. I certainly decry this operation, and I predict in ten years not a member of this Society will be doing interposition operation.

Dr. Joseph Brettauer.—The idea of this operation originated with Freund, of Strassburg, who proposed and actually did use the body of the uterus to close up a large vesicovaginal fistula which he could not close in any other way. That was the beginning, I believe, of the interposition operation. Shortly afterward, Wertheim, in one of his papers on plastic operations, mentioned the possibility of using the uterus as a truss for the bladder. He had not done it, but he mentioned it as a possibility.

In 1896 I published a short article,[1] having carried out this idea in half a dozen cases that had passed the climacterium, with the result that I did not think it was a proper operation; that we had other more satisfactory methods. I did not use it for fifteen years, until about six months ago, when I had to operate upon a patient who had had a previous operation for cystocele, which had recurred to a nearly maximum extent. In this case, the uterus being of good size, I thought I might possibly close the very large opening in the fascia with the uterus. It was a matter of ten or fifteen minutes' duration, and no difficulty whatever was encountered. Within two months after this operation, I was obliged to extirpate the uterus entirely, because the woman *was very much worse* than she was before I did the interposition operation. In dissecting the uterus away from the bladder, a thin shell of the posterior uterine wall was left and I was able to build up a very good bladder wall. The patient was cured not only anatomically, but symptomatically.

Just a word or to with reference to Dr. Studdiford's remarks regarding the cure of rectocele. I do not know how it is with other men, but my experience has been that all cases of rectocele and prolapse are of old standing. They are principally in women who have passed the climacterium, very rarely in young women, and the muscles, as Dr. Studdiford has mentioned, are atrophied. You cannot go in and cut through the fascia and demonstrate the belly of the muscle, as Dr. Hirst wanted us to believe. At least I never could, therefore I adhere to my old principle, not to try to dissect the muscle anatomically, but to place my suture through the fascia, through large muscle stumps that are adherent and bring the scar containing the muscle ends together. During the past fifteen years my results have been very satisfactory to me.

Dr. Matthew D. Mann.—In regard to the treatment of prolapse of the uterus, I have always tried to keep several points in mind, and the first was to restore the uterus to a normal condition so far as possible, reduce it in size and length, either by amputating the cervix or sewing it, by curetting and doing whatever was necessary to restore the organ to a normal

[1] New York Medical Journal, vol. lxxv.

condition. The second point was to cure the cystocele which exists with these cases of prolapse by taking out a piece of the anterior vaginal wall, bringing the fascia together and pushing the bladder up as far as possible, and attaching it to the uterus in front as high as I could, and then closing the perineum by an operation which I have found very satisfactory, namely, the one Dr. Gordon spoke of, the old Emmet operation, and in this way you get a good firm, support of the uterus. There is one thing to remember, and that is you must take some means to keep the uterus anteverted and restore the pelvic floor. The parts are so atrophied in many ways, so wasted, that there is very little tissue and you do not get support and strength enough in the tissues from the long-continued atrophy which has been going on. I do not like to attach the uterus to the abdominal wall in front, especially in child-bearing women. I have followed up the other operations that have been spoken of, and they work exceedingly well in keeping the uterus anteverted. If you let the uterus turn over by some operation it cannot come down, and the operation that has worked best is the Gilliam operation, bringing the round ligaments up through the recti muscles. By so doing I find the results exceedingly satisfactory, and these cases of prolapse are cured without any interposition operation. I do not like the idea of putting the organ in such an abnormal position and making a condition necessary which would call for the sterilization of the woman and prevent her from bearing children on account of the risk. This combination of operations, keeping always in view the particular points to restore the supports from below, to put the uterus in a normal condition and keep it anteverted by some other operation, will give very satisfactory results.

Dr. George Gellhorn.—I confess, Mr. President, that I am one of those heretics whom Dr. Cushing has publicly arraigned. I have been a friend of the interposition operation for more than ten years, but not having a large operative material and limiting the operation strictly to women who have passed the child-bearing age, I have only done the operation in twenty-five cases. I admit that, for certain reasons, the operation is not perfect, but what other operation is?

Dr. Watkins spoke of vesical irritability which sometimes follows the operation. If you make a cystoscopic examination

after the operation you will find a cause for that. You find in the vesical mucous membrane, and particularly in the trigonum, a number of ecchymoses which are slow in being absorbed, and these are the cause of the irritability. It is due to the fact that the bladder wall has become thinned out by the abnormal position of the cystocele, and is apt to be subjected to slight traumatism when, during the operation, the bladder is pushed off the uterus. This traumatism is intensified if the uterus which has to be interposed is too large; then undue pressure is exerted, and in such cases the interposition operation does not seem to me desirable. The uterus must not be too large so as to become angulated. One can avoid that by amputating the cervix or amputating the body of the uterus, but in either event this is a more or less tedious and bloody operation, and in such a case, with an exceptionally large uterus, I believe the procedure mentioned by Dr. Bovée is the better one, I should regret very much if the interposition operation should disappear from our armamentarium, for it is one more good method to choose from in an individual case.

Dr. Thomas J. Watkins (closing the discussion on his part).—Angulation of the cervix near the internal os may occur from one or two errors in technique. Broad separation of the anterior vaginal wall from the cervix and amputation of the cervix when indicated will eliminate the danger of angulation.

Dr. Polak brought out a point in his paper which is extremely important, which I also mentioned in my paper, namely, inclusion of all of the submucous connective tissue in the sutures. If one does not use great care, this tissue retracts, is not included in the sutures, and materially determines the strength of the resultant wound.

During the last year we have been making careful observations relative to the bladder symptoms before and after operation. They are about the same as before for two or three weeks after operation and then disappear. The symptoms before operation are often so chronic that they receive scant notice in the clinical history.

We have made very few tubal ligations, as the transposition operation is not often indicated during the child-bearing period. Before the senile changes of the menopause take place the prolapse very seldom becomes so extensive as to require this opera-

tion. Other operations that do not interfere with pregnancy and labor, such as vaginal fixation of the round ligaments, advancement of the vagina on to the uterus. The operations of Goffe, Reynolds, or Vineberg and others are preferable in such cases. Suture of the connective tissue close to the pubes, as mentioned by Dr. Stone, is a valuable suggestion. I am very glad Dr. Stone took part in the discussion because he did much independent pioneer work in the development of the transposition operation.

I would like to apologize to Dr. Brettauer for having overlooked his contribution on this subject. This operation should not be made in a woman who is liable to become pregnant.

It did not seem to me necessary to defend this operation as an important surgical procedure in well-selected cases. This operation is done extensively in this country and Europe, and one rarely or never hears a criticism of the operation from men who have done it. Most of the criticism, is not all of it, has come from men who have had no experience with the operation.

Putting these organs in a different place from where Nature placed them is not so important after the menopause. It does not make much difference to Nature how some of the organs are placed after they have completed the function for which they were destined. Transposing the relative positions of the uterus and bladder after the menopause is an improvement upon Nature. It is difficult for one who has not done this operation to appreciate how little displacement takes place. After one transposes the uterus and bladder and makes a vaginal examination, he is impressed with the fact that the uterine canal is parallel with the vaginal canal. In apparently perfectly normal pelvic organs the uterine and vaginal canals are in occasional patients nearly parallel.

Dr. Barton Cooke Hirst (closing the discussion).—I am glad to have the opportunity to say a few words in answer to the criticism of my short paper on perineorrhaphy. In the first place, I think those who have looked into the subject and have done a great deal of this work, must agree with me that the older operations are not entirely satisfactory. My professional life has embraced almost the whole history of perineorrhaphy. When I was Dr. Goodell's associate I was doing the old Bischoff butterfly operation; after returning from Berlin I tried the

Martin operation, and then the Emmet, which I learned from Emmet himself; then the Hegar operation; the Tait operation, and its modern modifications, but none of them gave ideal results, and I think my colleagues who have done all these operations extensively will agree with me. The question arises whether it is not possible to learn exactly what happens to a woman injured in childbirth, and then to base an operative technique on such observation. The only way to study these injuries of childbirth is to do as we do in the University Maternity, namely, put the women on an operative table, anesthetize series of them on successive days of the puerperium up to the fifth or sixth, when the edema, the distortion, the bruising of the tissues has disappeared and we can see exactly what has happened by using different specula and forked retractors.

My experience differs from Dr. Studdiford's in that I find quite a number of cases of distinct lacerations of the pelvic fascia of the vagina, and of the levator ani muscles, but naturally not in every case. It is only in cases seriously injured that there are disagreeable after effects requiring a secondary operation. I could easily demonstrate at any time a number of cases of laceration of the fascia over the levator ani, the levator itself being torn in the manner I have described.

The members of my staff and myself undertook the study of this subject without preconceived ideas, and can only record what we have seen.

As to the technique advocated in my paper it was worked out on this basis. Of course, any operator of experience will devise his own technique, but I feel convinced that the principles of this operation are the principles that will govern our future work in restoration of the pelvic floor, and I am encouraged to think that the technique I am working with now is on right lines from the opinions I have heard expressed by visiting surgeons to my clinic. It is not easy to understand a pelvic floor operation from description. It was a joke among my associates of twenty-five years ago that no one could read Emmet's description of his operation and then do it. The only way was to see Emmet perform it himself, and that most of us did.

I believe if my colleagues will try the operation for the restoration of the pelvic floor based on the principles I have outlined they will find it more satisfactory than any of the older methods.

Certainly that has been my experience. I can get better result with this technique than with the butterfly operation, the Martin operation, the Emmet operation, the Hegar operation, or the Tait in its modern modifications, these operations comprising the various forms of pelvic floor repair, at present in vogue.

THE CLINICAL MANIFESTATIONS OF DISEASES OF THE GLANDS OF INTERNAL SECRETION IN GYNECOLOGICAL AND OBSTETRICAL PATIENTS

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After studying for a number of years the function of the ovary experimentally in the laboratory, it seemed desirable to apply some of the facts obtained to clinical investigation. Obviously, the first step involved a careful study of the literature.

Several exhaustive treatises, dealing with the ductless glands (Swale Vincent, Biedl, Falta), give an impartial review of the innumerable papers which have been published, but, in the main, do not succeed in unifying the widely differing observations and views recorded. The monographic literature, when studied from original sources, is even less conclusive. Therefore, as is so common in every new subject, the resulting confusion hampers research and retards advancement of knowledge.

The object of the present paper is an attempt on the part of the writer (originally designed merely to clarify his own views sufficiently to permit of the use of intelligent therapeusis in certain functional diseases of the genital tract) to simplify the involved question of the relation of the genital tract to the ductless chain. This simplification involves the acceptance of more or less rigid standards, both morphological and clinical; standards which are by

no means final, and which from time to time will require revision or change.

As real progress must depend upon the coöperative efforts of many workers, the subject appears of sufficient importance and interest to warrant its presentation to this Society in this necessarily incomplete state.

In order that the points at issue may be understood, the main phases of the entire subject to be discussed, must be presented, at least in outline. These phases include the function of the various ductless glands upon the entire body; modification of function due to interaction or corelation of groups of glands; direct or indirect action upon the genital sphere; and reversely action of the gonads upon the other glands. The anatomy of the ovary and its variation resulting from functional changes, naturally form a basis for much of this study. Lack of time necessitates the presentation in the form of a brief outline in which only a few striking examples are quoted, just sufficient in number to illustrate the salient features. Further details will be found in the published paper.

Individual Glands. Each gland of the ductless chain (which includes the hypophysis, pineal body, thyroid, parathyroids, thymus, pancreas, adrenals and gonads) has one or more functions. Of these, one is usually the vital, main or most important function, the others being subsidiary.

For example the hypophysis appears to govern the growth of the bones and soft parts of the extremities; incidentally it affects the carbohydrate metabolism to a considerable degree.

The influence of the glands is exerted in several ways, partly by their general effect on the metabolism, partly through the nervous system, and partly by specific local action, often exerted upon distant organs, sensitized by chemical means (hormone action).

Interaction of Glands. The clearness of the apparent action of an individual gland may be masked by the interaction of its synergists or antagonists, in such a fashion as to intensify, decrease or neutralize its effects.

Such effect may become apparent during the course of acromegaly. Usually in this disease, the sugar tolerance is increased. Occasionally a diabetes develops, if the pancreatic islands become sclerosed. Many similar examples are known.

Action of the Ductless Glands on the Genital Tract. The genital tract responds to all stimuli to which it is sensitive, irrespective of their source or variety, in one of two ways: by increase or decrease of its activity. Regarded from this point of view the ductless glands naturally fall into three groups:

1. *Specific influence*: thymus, pineal, adrenal.
2. *Non-specific influence:* hypophysis, thyroid.
3. *Indifferent:* pancreas, parathyroid.

In the first group, for example, early thymus involution is followed by premature sexual development; thymus hyperplasia and persistence causes retardation of sex development (infantilism).

In the second group, it will be noted that both overactivity or underactivity of the hypophysis or thyroid eventually produce genital aplasia, although this final stage may be preceded by a transitory period of excitation.

Eventually it may prove feasible to work out the detailed influence of the various glands. At present such endeavors are purely tentative. For example, the influence of the adrenal, as manifested at various ages may be chosen.

Hyperfunction of the adrenal:

In utero: accompanies pseudohermaphroditism.

In infancy: produces precocious sexual development.

In adults: causes hypertrichosis of the hetero sexual type.

Hypofunction of the adrenals:

In utero: associated with anancephalus.

In adults: produces genital aplasia (Addison's disease).

In puerperio: found in puerperal uterine inversions.

Local Changes in the Genitals. Both anatomically and functionally the local changes, broadly considered, are, likewise, only of two types, on the one hand hypoplastic and hypofunctional, and on the other, hyperplastic and hyperfunctional. This fact is usually lost sight of because of the many apparent variations due, in the first place, to the age at which the changes develop, and, in the second place, to the site in wich the main alterations manifest themselves.

For instance, when influenced early, the secondary sex characters are profoundly affected, the pelvis may remain infantile, the breasts undeveloped, the extremities disproportionately long. The same influences acting in adult life would scarcely, if at all, affect these parts.

Less markedly, but still noticeably, different parts of the genitals proper, the external genitals, vagina, cervix, uterine body, etc., are influenced in different degrees by stimuli, many minor variations resulting. Therefore, in one case a hypertrophic clitoris may be noted in conjunction with a small cervix and long uterine body; in another the external genitals may prove hypoplastic, the cervix elongated, but the uterine body barely perceptible.

Effect of the Gonads on the Other Ductless Glands. The effect of hyperfunction of the ovary is most clearly shown in the rare cases of ovarian tumor developing in infancy, in which all the symptoms included in the complex "precocious adolescence" develop. Removal of the tumor may produce prompt regression of all symptoms. Explanation of these phenomena as yet defy analysis.

Hypofunctional conditions of the ovary are common but except as produced by castration, are accompanied by other issues which obscure. Castration is followed by

recognizable anatomic changes (hypertrophy) in the hypophysis, adrenal cortex, and before puberty, in the thymus and pineal gland. The thyroid may increase or decrease, the pancreas and parathyroid showing no changes. According to the literature castration produces profound changes in the metabolism. Much of this work is contradictory, much incomplete or actually wrong. New and comprehensive observations are most urgently required.

Mechanism by Means of Which Genital Changes are Produced. Anatomical changes (whether hyperplastic or hypoplastic) as well as functional variations (whether hyperfunctional or hypofunctional) either arise in or are transmitted through the ovary and thus reach the genital tract. The normal mechanism, by means of which the ovary performs its function is gradually becoming clearer, and lately has been extended to human pathology. The work of Hitschmann and Adler, Miller and Meyer and Ruge deserves special mention.

To be considered are the:

1. Prepuberty changes (follicle ripening, atresia (?).
2. Adult changes (corpus luteum).
3. Pregnancy changes (corpus luteum plus ovum).

In order to show that the various changes in the ovary are readily recognizable and presuppose no profound knowledge of pathology, a number of lantern slides will be thrown upon the screen. These microphotographs were selected from specimens examined in the course of routine work.

They illustrate:

1. (*a*) the development of the human corpus luteum from the rupture of the follicle to the period of regression, and corresponding sections taken from the uterus to show the relation of the uterine to the ovarian cycle.

1. (*b*) the characteristic features of the corpus luteum of pregnancy.

2. The process of atresia with formation of the theca lutein cells and interstitial gland.

Lantern Demonstration

A summary of the inter-relation of the various processes as understood is as follows:

1. *In childhood* the growth and ripening of the follicle (according to some also the theca lutein changes in atretic follicles) control the growth and development of the genital tract and usher in puberty when the thymus and pineal influence is withdrawn.

2. *Sexual maturity* begins with the first ovulation. The resulting corpus luteum produces the cyclical changes in the uterus as just illutrated. It also, probably aided by the other glands, causes the full development of the secondary sex characters. As soon as the corpus luteum regresses a new follicle begins to ripen and the cycle is repeated.

3. *Pregnancy.* If, after ovulation, which appears to take place from one to fourteen days after menstruation, the ovum is fertilized and embedded in the uterine mucous membrane (which has been prepared for its reception by the chemical action of the corpus luteum) it in turn reacts on the corpus luteum and accounts for the persistence of the yellow body throughout pregnancy. The persistent corpus luteum prevents: (1) wasteful follicle ripening during pregnancy; (2) produces the breast and other general pregnancy changes, either alone or with the aid of the products of conception and other ductless glands.

4. *Climacteric Changes.* Cessation of ovulation occurs either because all the follicles are expended, or the inhibitory influence of other ductless glands predominates.

5. *Accidental Conditions.* Removal of the corpus luteum disturbs the cycle. Removal before the fourteenth day, after the onset of menstruation, postpones the next menses; if removed after the fourteenth day, the menses recur within two to three days. Removal before embedding of the ovum is complete probably produces abortion.

Lack of time prevents any discussion of the as yet little understood anatomical changes which accompany conditions of hyper- or hypofunction of the genitals.

Clinical Manifestations. In spite of the manifold manifestations, all functional conditions can be grouped under two headings: those of hypofunction and hyperfunction.

I Hypofunction.

(*a*) Apparently primary. In addition to the local changes, systemic changes almost always can be noted.

1. Local: uterus (small, infantile, etc.); fornix, (conical, short, etc.); external genitals (hypoplastic, etc.); functionally (amenorrhea, dysmenorrhea, scant menses. sterility, etc.).

2. Type: stolid, obese; high-strung, thin.

3. Secondary sex characters: eunuchoid (long extremities, scant breasts, hair, etc.); heterosexual (hair and fat distribution male in type, also larynx, funnel pelvis, etc.).

4. Vasomotor symptoms (exemplified by castration phenomena).

5. Various changes in the blood picture, coagulation time, general metabolism.

(*b*) Secondary. Similar changes noted during acromegaly, Addison's disease, etc.

II. Hyperfunction.

The main symptoms are menorrhagias and metrorrhagias. As the trouble usually develops after puberty, changes in the secondary sex characters are less apparent. Fecundity is frequently increased.

(*a*) Apparently primary.

1. Before puberty (rare): precocious menstruation and adolescence.

2. At puberty: menorrhagia and metrorrhagia.

3. Adult: menorrhagia and metrorrhagia either with normal or "metritic" uterus.

4. Preclimacteric hemorrhages.

(*b*) Secondary (rare). A transient stage of excitation noted in Graves' disease, after thyroidectomy, in acromegaly, etc.

III. Conditions in Pregnancy.

Definite classification is impossible as no unanimity of opinion exists as to whether the ovary is over or underfunctionating. We know that the hypophysis, thyroid and adrenal cortex are stimulated in normal pregnancy.

Osteomalacia and tetany are due to disturbance of the glands of internal secretion. Thyroid overaction is common. Certain types of habitual abortion are ascribed to incomplete development of the corpus luteum.

Diagnosis. The complex mechanism which produces the various functional disturbances merely epitomized in this abstract can never be solved by the routine gynecological examination as now practised. In order to attain progress in knowledge and advance in therapy much clinical research is necessary. The outline here given contains suggestions, which will vary in each case, and which will undoubtedly require modification as new facts are elicited. In a modern hospital the coöperation of the various staffs (gynecological, obstetrical roentgenological, pathological, chemical, etc.), can be enlisted to make the task of each individual less arduous.

A. Local Examination Including:

(*a*) Internal genitals; size and position of uterus, relation of cervix to fundus, shape of vagina and fornices; examination of curettings (with regard to menstrual phase); study of removed ovaries and uteri.

(*b*) External genitals: development; especially of clitoris.

(*c*) Type of pelvis: infantile, feminine, neuter; measurements.

B. General Examination Including:

(*a*) Secondary sex characters: hair distribution, (mons, perineum, axillæ, face, etc.); fat distribution (especially

on nates, lower abdomen, supraclavicular fossæ, supra-orbital); larynx and voice; dimensions (length, relation of extremities to trunk); breasts (size, shape, fat or gland, nipples).

(*b*) Size and function of thyroid (pulse rate, tremor, eye symptoms, acetonitril test of Reid Hunt).

(*c*) Enlargement of lymph nodes, thymus persistence if ascertainable.

(*d*) *X*-ray of cella turcica if acromegalic or eunuchoid symptoms are found, also of epiphyses of long bones when dimensional anomalies are encountered. In appropriate cases the ocular fundi, the field of vision (sight, color); reaction of nerves to electricity must be tested.

C. Blood Examination:

(*a*) Full blood-count (number of leukocytes, proportion of neutrophiles, lymphocytes and esinophiles are most important).

(*b*) Coagulation time (by Wright's method or some modification).

(*c*) Blood-pressure.

(*d*) In appropriate cases investigations of the amount of glycogen, lipoids (fat, cholesterin, and cholesterin esters).

D. Sugar tolerance (increase, decrease; amount of dextrose necessary to produce glycosuria).

E. Reaction to drugs, especially to:

(*a*) Adrenalin (local mydriatic, general glycosuric).

(*b*) Pilocarpin (sweats diminished in hypofunction, increased in hyperfunction.

(*c*) Atropin (susceptibility).

F. If the services of a physiological chemical laboratory can be enlisted, metabolism examinations in cases of special interest. These would include:

(*a*) The respiratory coefficient (relation of O_2 intake to CO_2 excretion).

(*b*) Analysis of the food intake (fat, protein, carbohydrate, P_2O_2, S, Ca, Mg, etc.).

(*c*) Simultaneously similar analysis of the urinary and fecal excretion, and of the intermediate products of metabolism. (The numerous current reports based solely upon the urinary excretion are of no value, as in many diseases deficient or increased excretion through the kidneys is compensated by an increase or decrease of excretion through the bowel.)

A careful record of even a limited number of cases observed with regard to the factors just indicated would prove of far greater value than large numbers of incomplete reports. The value of such clinical research, which is urgently needed, would be further enhanced by extending the observations to three periods: before, during, and after treatment.

TREATMENT.

1. Organotherapy.

(*a*) Ovotherapy applicable in hypofunctional troubles. All methods of use have continued to be disappointing. Some report good results in the treatment of the vasomotor symptoms. The lipoid extracts have not been given sufficient clinical trial. They are highly toxic to animals.

(*b*) Thyroid extract gives variable results. I have obtained fair results in amenorrheas with obesity, if the genital atrophy was not extreme and tachycardia did not develop. In certain types of early vomiting of pregnancy, small doses act like magic. Unless the good effect appears within two to three days further trial proved harmful. Sehrt recently reports success in menorrhagias accompanied by decrease in blood-coagulation time. He used iodothyrin.

(*c*) Adrenalin has been employed in osteomalacia.

(*d*) Pituitary extract, anterior lobe, has not been sufficiently tried. Pituitrin has proved of great service during labor.

(*e*) Combined organotherapy, at present, is purely empiric.

2. *X*-ray treatment of ovaries for hyperfunction. After all due precautions to exclude organic disease have been

observed, gratifying results can be obtained in intractible hemorrhages of puberty, maturity, and the preclimacterium. Where amenorrhea is not desired, careful graduated dosage must be employed. The use of this agent to produce the primary stimulating effect in hypofunctional conditions is not justified.

3. Resection of the ovary for the relief of dysmenorrhea, sterility, or anomalous bleeding is justified only when the abdomen is opened for some weighty reason.

4. Transplantation of the ovary in special cases may be justified. Permanent results are but rarely obtained.

5. Local uterine treatment is of little value. Of the various methods the stem pessary is best. It probably acts by accentuating the decidual reaction. Curettage may afford temporary relief of bleeding. It is important chiefly as a means of diagnosis.

6. General systemic treatment by hygiene and drugs is of value because our means of specific treatment are so scant.

DISCUSSION

Dr. William P. Graves.—We are all of us very much indebted to Dr. Frank for the elucidation of a very difficult and confused subject. Those of us who have made an attempt to keep up with the literature on the subject appreciate the chaos in which it stands at present, and therefore we are specially grateful not only for this paper but for other contributions that Dr. Frank has before presented.

The subject is limitless. What I am going to say is simply to bring out a few practical points which may be of interest in our relation to it as surgeons. The most important and practical point that we all think of first is the influence of castration on adult women. This is important on account of the frequent necessity of hysterectomy in our present treatment of gynecological diseases. Such disease as destructive pelvic inflam-

mation, fibroids of the uterus, tumors of the ovary, etc., require the performance of a large number of hysterectomies, especially in the working classes. In a great many of these cases it is necessary to remove the ovaries. When the ovaries are left in or there is transplantation of ovarian tissue they eventually become atrophied and cease to functionate so that all hysterectomies are practically castrations. My observations in this matter comprise 445 hysterectomies collected from my private and hospital experience. Of this number 54 have been complete hysterectomies, the majority of these being extended operations for cancer of the uterine body and cervix. The complete operations form a distinct series. On account of the severity of the complete operation and of the overpowering considerations in the matter of recurrence of cancer, etc., they are not as practicable for the study of the influence of castration as are the cases of supravaginal hysterectomies. They have therefore been excluded in my investigations. My observations are confined therefore to a series of 392 supravaginal hysterectomies: in a very few of these ovaries were left behind. In about 50 of them there was transplantation of ovarian tissue in the broad ligament or in the abdominal wall. On account of the general prejudice that exists against hysterectomy among the laity and among many members of the profession, especially with regard to the after-effects of castration, there were certain inquiries which I wished to make in the later history of these cases:

1. The effect of castration on the general nervous system.
2. The relation of castration to vasomotor disturbances as distinguished from general postoperative neuroses.
3. The relation of castration to sexual feelings.
4. The relation of castration to the general health.

In the first place I had noted in my own cases and in those that came to me from other men that bad results to the nervous system were usually attended with certain local and constitutional troubles. Some of these neuroses were due to improper technique in the operation, for example, where the cervix and pelvic floor had not been properly supported, so that symptoms of prolapse ensued. Another frequent cause of neuroses was extensive postoperative adhesions. I therefore endeavored to develop a technique in the operation which would avoid as much as possible difficulties from the primary operation, more

especially those that result from prolapse and adhesions. The 392 supravaginal hysterectomies include all that I have done up to the present time. The ultimate results are taken from statements of patients that were operated on before last October. The information was gained either by letter or by verbal report.

I was able to get fairly reliable data in 263 cases as to the effect of the operation on the general nervous condition. Of these cases 49 reported that they were more nervous than before the operation. All the others reported either that their nervous condition was very much improved or that there was no change. Of the 49 patients who said that their general nervous condition had been made worse by the operation all but 6 had suffered from chronic pelvic inflammation and were chronic nervous invalids before the operation. It is fair to assume that many of these had habit neurosis which can only be overcome by neurological treatment. A considerable percentage of the cases were vastly improved in their nervous condition; several of them were cured of true psychoses. We can hardly say therefore that the removal of the ovarian secretion has a definitely deleterious influence on the general nervous system.

The next inquiry was with regard to vasomotor disturbances as typified specially by hot flushes. Out of 263 cases 20 per cent. had no hot flushes or vasomotor disturbance, all but a very few of these patients having had both ovaries removed; 31 per cent. suffered distinctly from hot flushes which lasted on an average of three months. The other patients had vasomotor disturbances which they said did not give them much trouble. Several important observations were made in regard to these disturbances. For example, one woman on whom hysterectomy for fibroid was performed had very few vasomotor or nervous disturbances following her operation. A postoperative hernia developed, however, and she was operated on again a year following her operation. After the operation for postoperative hernia she began to have severe hot flushes which have now lasted three months without letting up. In another case of hysterectomy for fibroid the patient made an excellent recovery without nervous disturbance for six months. She then had an acute pleurisy which eventuated in an adhesive pleuritis which gave much pain. After this attack vasomotor disturbances and other neuroses ensued which continued for many months.

Out of 218 cases from whom data could be extracted in regard to sexual feelings there was diminished feeling in 20 per cent. This corresponds closely to the observations made by others.

In the 263 cases the general health was improved or made entirely well in 93 per cent. Of the cases that were not improved or were made worse all but two were of the chronic pelvic inflammatory type.

The conclusion that I have drawn from the study of these cases is that the removal of the ovarian secretion has no profound, specific influence on the general health of the adult woman. In this respect hysterectomy differs little from the other major abdominal operations. Severe postoperative nervous manifestations are usually due to operative complications or incidental disease rather than to loss of ovarian secretion.

Another practical point to be considered is the atrophy of the external genitals. This usually follows soon after castration and is to my mind one of the most impressive proofs of the actuality of the ovarian secretion. The anemia of the parts usually comes on almost immediately, so that it can be distinguished before the patient leaves the hospital. This corresponds theoretically to the experimental work that has been done on animals which shows that the injection of ovarian extract into castrated animals causes hyperemia of the external genitals. This fact has proved of value in organotherapy. The occurrence of atrophy of external genitals after castration is an important practical point to consider in cases where one has to do a hysterectomy and a plastic operation on the vagina at the same time, in which case great care must be taken to allow for the atrophy in repairing the perineum so that eventually it will not be too tight.

With regard to organotherapy my experience has been chiefly in using the ovarian extract which I have found more valuable than the extract of corpus luteum. I have used the ovarian extract for a number of years in a great many cases, principally for the vasomotor disturbances following hysterectomy. I have occasionally used it with patients suffering from these same disturbances during the natural menopause. My results have been extremely satisfactory. I regard the ovarian extract as a useful and valuable remedy, especially in cases of troublesome hot flushes. I have kept records of these cases and expect to publish them later.

In one case of kraurosis of the vulva I have found ovarian extract to be of great use. Schickele was the first to report a case of kraurosis vulvæ cured by this remedy. My case was published in the *American Journal of Obstetrics and Diseases of Women and Children*, 1913, vol. lxvii, No. 4.

I have also found it useful in some cases of pruritus or where there are disturbances from chronic anemia of the external genitals.

In cases of amenorrhea and lactation atrophy and numerous other gynecological conditions I have found the ovarian extract of little value.

Dr. George Gellhorn.—To do full justice to Dr. Frank's paper would require a much more thorough knowledge of the interrelations of the ductless glands than I possess. I venture to say a word or two on my therapeutic observations, because in this field very important conclusions have been frequently drawn from the results of our treatment. I have used ovarian extract a great deal and over long periods of time, but the results are not uniform enough to draw any definite deductions. I have, however, made observations in two rather striking and totally different cases which will permit of a conclusion being drawn.

After the publication of Dr. Graves' paper on kraurosis of the vulva I applied the use of the ovarian extract in a marked case of kraurosis which had driven the woman to distraction, and in which the anatomical changes about the vulva were so extensive that I considered the case inoperable. The typical changes of atrophy, dryness, and glistening of the skin were not limited to the vulva, but involved the anus as well, and I felt technically unable to cope with the situation. At that time, fortunately, I read of Dr. Graves' experience, and was benefited by it by obtaining a most striking result which has lasted now for eight months. The woman every now and then takes ovarian extract whenever she feels the itching or burning returning.

The other case, which is even more striking, and which I would like to have Dr. Frank comment upon, is one of esteomalacia. Osteomalacia is almost a theoretical disease in America because we have so very few cases of it. I have had the good fortune of observing a case of this kind and in a most aggravated form. The case was most unusual insofar as it occurred in a multiparous woman after the menopause. This woman took ovarian extract by mouth. In addition, as I never could quite

understand how the ovarian extract could work by mouth, because it must undergo chemical changes in its transit through the stomach. I injected ovarian extract intramuscularly in the gluteal region without harm, the warning of Fränkel and the other authors to the contrary notwithstanding. This woman got well symptomatically for awhile, and I was able to demonstrate her before the German Medical Society in St. Louis, which meets on the second floor of a building where there is no elevator, and that woman actually walked up there. She had not been out of a chair for years. I took her to the meeting place in my automobile, and then I assisted her as she walked up stairs. In this case I thought the result was most remarkable. Moreover it was a very perplexing result for in osteomalacia it is by removing the ovaries that we usually cure the patients; but here I had added the ovarian extract and yet the patient got well—one of the many riddles which I cannot solve, but perhaps Dr. Frank can.

Dr. Hugo Ehrenfest.—I would like to give expression to the feelings we all have after listening to the interesting paper of Dr. Frank on a subject which we know very little about. But I am afraid possibly many of you will miss one of the salient features of his very interesting and splendid sketch, and that is that at the next meeting, or in two years from now, he will probably help us to know more about the subject by the proper study of cases. He mentioned standardization. We heard yesterday from Dr. Dickinson—and I think this is the salient feature of Dr. Frank's paper—that we should adopt a standard study of all these cases of menorrhagia and metrorrhagia according to the exact points Dr. Frank has mentioned in his paper, and I hope in closing the discussion he will tell us how to go about it, so that we can understand and grasp the cases better and act on the knowledge he has given us.

Dr. Matthew D. Mann.—I would like to ask a question in regard to one condition which has perplexed me, and that is pseudomembranous dysmenorrhea. It would seem to be an excess of a normal process and normally placed as to time. Is it due to any excess or absence of any normal secretion, and if so, is there any organotherapeutic measure which can be suggested theorectically or which has been proved practical to use in these cases? I ask for information.

Dr. Edward Reynolds.—We are greatly indebted to Dr. Frank for this contribution. There can be no question in the

minds of those of us who have been watching and thinking on the subject that little as we know, its possibilities or probabilities are overwhelming and every man who can add to our knowledge does an immense benefit. As Dr. Mann got up I was about to rise to ask the same question which I would like to supplement a little by relating a case. Some four or five months ago I saw a well-marked case of pseudomembranous dysmenorrhea in the course of an operation for other purposes. In two cases since then, after a conservative operation on the ovary which was enlarged by an apparently persistent corpus luteum, I obtained a history of partial pseudomembranous dysmenorrhea which had persisted for more than a year. I would like to ask Dr. Frank if he can throw any light on that?

Dr. Herman J. Boldt.—I rise for the purpose of seeking information. We have no right whatever to doubt the careful observations from a clinical point of view of the value of ovarian extract made by different observers and its result on the vasomotor disturbances. But why is it that in the hands of some observers, like Dr. Graves and others, the results have been so favorable, while, on the other hand, according to the observations of Dr. Frank and myself, the results have been practically *nil*. I should like to get some information on this point if they can give it to me.

Dr. William Horace Morley.—I think the question that has been asked by Dr. Bolt concerning the use of the ovarian extract or desiccated corpus luteum can be answered by stating the time that it should be given. Most practitioners, I think, give it after meals. The best time to give the corpus luteum extract is at least an hour before meals, as absorption is better on an empty stomach, and hence you will get better results. We know that the dried corpus luteum lowers the blood-pressure. One can control the absorption by taking blood-pressure before the treatment is commenced and after the treatment has been going on for some time; a lowered blood-pressure will show that the absorption is better if the dried gland is given one hour before meals.

Dr. Robert T. Frank (closing the discussion).—I am very grateful to the gentlemen who discussed the paper, because they have brought out points which in the hurry of reading my paper could not be emphasized. Some of the questions that have been asked I am, however, unable to answer.

Dr. Graves has given a practical clinical application to some

of the points referred to in my paper. The main point, however, that I attempted to make was that again emphasized by Dr. Ehrenfest. I found these same variations in response to treatment which I was unable to explain, and therefore, because of this, before undertaking a serious study of the clinical effects I wanted to simplify the subject for myself, and simultaneously to enlist the sympathy and coöperation of all other fellows in order that we may join in the study of these cases by adopting a more or less definite scheme. I do not for a moment suggest that mine is the best scheme that can be evolved. I personally have done very little work with ovotherapy because I do not as yet feel in a position to draw correct conclusions from either positive or negative results obtained. My standards in judging the results of ovotherapy, I am afraid, are hypercritical, and I am frank to confess that the overwhelming amount of evidence points against my negative view. However, the evidence is not all in one direction; just as in every other question that arises in connection with the ductless glands.

One more point that Dr. Graves discussed brought to my mind the following: I think it is a pity that an immense amount of material is wasted annually that could be utilized to good effect. When fibroids are removed we usually obtain the ovary and the uterus, in many cases with perfectly regular menstrual cycle; this material should be utilized in an effort to further our morphological studies.

In regard to what Dr. Watkins has said, I would like to ask him, in the first place, whether these studies of the corpus luteum were macroscopic at operation or controlled by microscopic observation?

Dr. Byford (in the absence of Dr. Watkins).—They were controlled by microscopic observation.

Dr. Frank.—Fränkel made a number of observations during the course of laparotomies, judging by the macroscopic look of the corpus luteum only. I have examined the corpus luteum macroscopically and then cut a cross-section grossly and made up my mind as to what stage it belonged to, and then controlled it by microscopic examination; the two observations rarely corresponded. My own clinical observation is that cases during menstruation in which corpus luteum exists are quite uncommon. In the first place the follicle may have ruptured recently and until Meyer told us how to look for this it escaped

attention. In the second place there is a general misconception as to the corpus luteum. Menstruation only occurs after the corpus luteum through its internal secretion has had an opportunity to sensitize the uterine mucous membrane. When menstruation finally occurs the corpus luteum has become old and inactive.

So far as the use of adrenalin is concerned I have had no personal experience.

Dr. Gellhorn brought out a number of interesting points, concerning corpus luteum therapy. The reason my results have been negative may perhaps be due to the fact that I did not know how to use it. In certain cases we use it, thinking there is a lack of ovarian secretion. We all know that these may be cases in which the ovarian secretion is in excess. I am starting new methods of trying to use corpus luteum extract on animals because some defect in the mode of administration may be keeping us from having uniform results. One of the defects may be due to the fact that the corpus luteum does not store up its secretion; it is not of the character of the thyroid, and only small quantities are in the corpus luteum at one time. In the experiments now under way we started with five pounds of corpus luteum to make extracts, to get large doses and test them out in massive quantity.

As to osteomalacia, we know very little about it. Osteomalacia occurs in males but we know nothing as a condition of the male gonads in this disease. These are cases that ought to be studied with greater care because the testis offers simpler conditions than the ovary. The best work done on the metabolism of osteomalacia has been done in Boston by McCrudden. His results show that cases of osteomalacia apparently cured may recur after many years have passed. If I remember rightly, recurrence in one of his cases took place after four years. I would like to ask Dr. Gellhorn how long ago this cure, which may be permanent, was observed?

Dr. Gellhorn.—The woman died in the meantime. She obliged me by getting well for the administration of the extract, but died six months later. Autopsy was performed by the pathologist of Washington University, and no cause of death could be assigned other than general inanition.

Dr. Frank.—How about the bones, were they examined?

Dr. Gellhorn.—I have the pelvis; I am not quite sure. I do not think the bones were examined.

Dr. Frank.—It would be a point of great value to know whether the bone changes persisted in spite of the symptomatic cure.

Dr. Gellhorn.—The autopsy was done jointly by Dr. Peterman and myself. We cut through the bones with an ordinary pocket knife and found them very soft.

Dr. Frank.—In other words, although the patient had symptomatically improved, the process had evidently not stopped, and that is in keeping with the general opinion now entertained about osteomalacia. I have no explanation to offer.

Dr. Ehrenfest's remarks I have already emphasized. Dr. Mann has asked me a question as to membranous dysmenorrhea. It is a difficult question to discuss. In the first place, I think on the whole we must distinguish between two groups of membranous dysmenorrhea; one apparently the exudative, and the other due to internal secretion. The latter is in keeping with the experiments of Loeb, who has shown, in animals, that when the uterine mucosa is irritated, at the time the corpus luteum is active, there is an enormous increase in the cells and changes in these cells. That is analogous to the excessive development of the uterine mucous membrane and the casting off which is seen in membranous dysmenorrhea.

Dr. Reynolds has asked a question which is of extreme importance, but which I am unable to answer. I am unable to distinguish between persistent corpus luteum and a corpus luteum which is well developed, because cystic and other changes are quite normal. Robert Meyer has written interestingly on the subject of pathological changes in the yellow body and I begin to feel that we are now on the right track. In one case of dysmenorrhea in which the abdomen was opened for the removal of two small fibroids by Dr. Brettauer, and the ovaries were resected, the patient after about six months was cured. I am not willing to draw any deductions because there was no persistent corpus luteum. That was the last case thrown on the screen, the one which showed a well-developed interstitial gland.

Dr. Boldt's remarks on why ovotherapy is variable, I have covered in acknowledging my ignorance on the question.

Dr. Morley's observation points to the fact that small variations as to the time at which the corpus luteum extract is given and the matter of dosage may have some effect on the results obtained.

FORWARD FIXATION OF THE CERVIX AS A PREDISPOSING CAUSE OF SOME RETRODEVIATIONS OF THE UTERUS AND AN OPERATION FOR ITS RELEASE

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Progress in practical matters is usually inaugurated by prior work on the theoretical considerations which underly it. This brief paper will therefore contain a statement of the views as to the support of the uterus which have guided me of late years, my conception of the anatomy of the abnormal condition which I believe is a predisposing cause in many cases of the retrodeviations, and a description of the operative procedure by which I am in the habit of correcting it. I feel bound, however, to say here that no one can be better aware than I am that under the limitations of time imposed upon us most of the statements which I am about to make are little more than personal assertions, nor indeed that my views are for the most part merely the result of personal clinical observations which cannot be accepted by anyone else as proof of their correctness. These observations have, however, extended over so long a period of time, and have to the best of my belief been conducted in so skeptical a spirit, *i. e.*, with so consistent an effort at the attitude of scientific doubt, that I am personally very strongly convinced of their correctness. The practical results which have followed their adoption have,

moreover, seemed to me to be so good that I am quite content to pursue the method in my personal work and quite convinced that in the process of time they will prevail.

The uterus is sustained in its position in the pelvis by the resultant of the action of a great number of unstriped muscular fibers which are partly disseminated throughout the pelvic connective tissue and partly aggregated into bundles lying within reflexions of the peritoneum which have long been falsely called uterine ligaments. The gynecological profession has been extremely slow in accepting this advance of knowledge in regard to the composition of the uterine ligaments, falsely so-called, but a search through the anatomical literature of the last ten years will convince anyone that among anatomists this is standard knowledge, and I think that no gynecologist can long watch the behavior of these tissues as he cuts through them during operation without becoming convinced of their retractile power, *i. e.*, of their muscular action. The chief bundles of such fiber are distributed along the course of the ovarian and uterine arteries, to which we must add the round ligaments, and it must not be forgotten that lesser quantities of unstriped muscular fiber are distributed throughout the entire body of the broad ligament.

My own observations during recent years have convinced me more and more strongly that study of the pathological spasms of these muscular structures is opening up a whole new field in gynecology, more especially in the relation of pelvic lesions to neurasthenia and the production of pain, but a reference to this is not my present purpose, which is the influence of these structures on the production and relief of the retrodeviations.

The uterus as a whole is then sustained by elastic (muscular) tissue and the cervix is the only part of it which is attached to the bones, or to the firm connective tissues

over them, by inelastic connective tissue, this attachment being the extremely strong and unyielding anterior vaginal wall with its firm attachments to the pubic arch, and the median Y-shaped ligament[1] first described by Goffe, which extends from the cervicovaginal attachment to the connective tissue above the pubic arch on each side of the urethra.

The anomaly known as anteflexion of the cervix is not separated by any sharp line from the normal slight forward curve of the organ, cases being found in every degree of variation from the normal, through the high normal and the slightly pathological, into the highest degree of anteflexion. It is now generally conceded that this abnormality is an arrest of development, but I think it is not generally understood that this arrest of development is never confined to the cervix along but necessarily includes also a short anterior vaginal wall, *i. e.*, an under-development of this firm structure and of Goffe's ligament, by which the vaginal cervix is held in forward fixation close under the pubic arch.

This shortened attachment holds the vaginal portion of the anteflexed cervix firmly forward, while the supravaginal cervix is at the same time steadied from side to side by the powerful muscular action of the lower portions of the broad ligaments along the uterine arteries, and drawn backward by the almost equally powerful uterosacrals. The fundus in its turn is held forward by the round ligaments, and the diffuse muscular fiber which is scattered through the peritoneal reflexion in which they lie. Such a uterus has an intrinsic angle in its shape situated at about the internal os, but with the vaginal cervix fixed forward and with the round ligaments drawing the fundus forward, the action of the muscular uterosacrals in drawing the middle of the organ back tends constantly to an exaggeration of this angle. With the onset of the catamenial congestion the

[1] It would be more exactly described as a sheet of fascia.

uterine walls engorge with blood and under primary hydrostatic laws the organ tends to resume its normal shape, *i. e.*, to efface any increase of angulation due to the action of these muscles.[1] Under these conditions with the cervix fixed forward and with the uterus trying to straighten itself, the fundus would of necessity turn backward were it not for the muscular action of the round ligaments and the unstriped fibers which accompany them. If then at any moment this action relaxes, even temporarily, the fundus must of necessity move backward, that is, in other words, with the cervix, the lower pole of the organ, fixed forward to an abnormal degree, any straightening of the organ under the influence of the menstrual congestion of necessity throws the fundus backward in some degree, though not always enough to constitute a retroversion; but we have long known that the moment the fundus moves backward even in a small degree it receives the effect of the general intra-abdominal force on its anterior face, and therefore tends to move farther backward, *i. e.*, to assume the first degree of retroversion, which then tends to become progressive.

I believe that in this mechanism we have an inherent tendency, a predisposition toward retroversion, which in the constantly recurring physiological congestions from one and another cause is extremely likely to be converted into a fact, an actual retroversion, at some time or another during such a woman's life. My first point then is that owing to the underdevelopment, the undue shortness of the anterior attachments of the cervix which are characteristic of anteflexion of that organ, women with anteflexion of

[1] Unfortunately these muscles, also, with the onset of the precatamenial congestion, tend to increase their action, to pass into more or less well-defined spasm; and the result of these antagonizing forces is backache and usually dysmenorrhea; but this only in passing—I am here concerned only with the production of the retrodeviations.

the cervix have a tendency toward retroversion as the result of slight accidental causes which would probably not produce that retroversion in the case of women in whom the lower uterine pole was in a normal position.

I had reached a tentative conclusion to this effect some five or six years ago, and since that time under continued observation I have, with the exception of a class to be spoken of shortly, rarely seen a retroversion of the uterus in which the amount of anteflexion of the cervix was not at least high normal or beyond the normal.

The class of which this is not true consists of those cases in which the uterus is dragged backward by the weight of a heavy new growth or by the posterior adhesions of an infected salpinx.

I have now come to believe that outside of this class of cases, and with, of course, possible rare exceptions, the retrodeviations do not ordinarily occur except in women in whom the cervix has more than a normal degree of forward fixation.

Time does not permit the discussion of all the varieties of the retrodeviations in this connection, but I may say in answer to a question which would at once present itself that when a descensus of the uterus occurs as the result of post-obstetric subinvolution and lack of perineal support, I believe that if the cervix is normally movable we get a descensus which eventually becomes a prolapse, but that under the same circumstances in a woman who is the subject of an anteflexion of the cervix, *i. e.*, of a forward fixation of the cervix, the descensus is converted into a retroversion by the fact that the fundus descends while the cervix is still held high. In all cases of forward fixation there is a tendency to retroversion because the cervix is held forward while the fundus is movable.

The diagnosis of forward fixation is best obtained by adding to the ordinary observation of the shape of the

uterus, of the direction of the vaginal cervix, and of the presentation of the os, a further estimation of the mobility of the cervix, which is obtained by the attempt to move it upward and backward with the finger or with a double hook.

A short series of observations on women some of whom have and some of whom have not the abnormality commonly called anteflexion will establish in anyone's mind the normal mobility of the cervix and the degree of forward fixation which may be considered an abnormality; and will, I think, further establish the comparative frequency of a degree of this abnormality which is mechanically effective.

The operative method which I have now come to adopt as a matter of routine in all cases of the operative treatment of retrodeviations which show any considerable degree of forward fixation of the cervix is to precede the abdominal treatment of the retrodeviation by a method of vaginal release of the forward fixation which I have already once described to you, but which I may briefly recapitulate here, more especially as I think I have decidedly improved my technique since the date of the former paper.[1]

After a preliminary dilatation and curettage the vaginal wall is seized with forceps immediately in front of the cervix and divided with scissors throughout its thickness, a narrow transverse strip being removed. The length of this transverse incision must vary somewhat with the size of the individual vagina, but it should ordinarily be just sufficient to admit the operator's index finger. The anterior lip of the cervix is then seized with volsellum forceps, one blade of which enters the vaginal wound, while the other lies within the cervical canal. Traction downward and backward brings Goffe's ligament into view. This is also divided

[1] "Anteflexion of the Cervix and Spasm of the Uterine Ligaments in Relation to Retroversion, Dysmenorrhea and Sterility," Surgery, Gynecology and Obstetrics, July, 1911, pages 17–24.

transversely with scissors over the whole width of the transverse wound, so exposing the loose connective tissue between the cervix and bladder. All the tissues in front of the cervix are then separated from it with the index finger passed through the wound up to or slightly above the level of the internal os, and as far out to either side as the finger can conveniently reach, thus freeing the anterior surface of the broad ligaments as well as the cervix. The transverse wound in the vagina is then brought together by a transverse running suture, thus elongating the anterior vaginal wall. If the transverse wound is too wide some narrowing of the vagina may result, but if this is watched for it can be easily avoided by a slight variation of the suture, *i. e.*, by bringing the lateral extremities of the cut together in the reverse direction (longitudinally to the vagina instead of transversely). During the first stage of this little operation there is frequently free bleeding, but it comes only from the cut edges of the vaginal wall, and if the division of the deeper tissues is done with the finger all bleeding will be controlled by the sutures. It is often well to make sure that the cavity is clear of clot before closing it, either by the use of a sponge or by irrigation. At the conclusion of this stage of the operation the cervix will be found to have become freely movable and to have receded into the posterior cul-de-sac, but since it is still crooked and the os still looks forward it is well in most cases to complete the operation by a discission of the posterior lip. This I formerly did after the method of E. C. Dudley, but experience has shown that this method leads to a subsequent eversion of the cervical mucous membrane in so large a proportion of cases, that instead of making a simple median incision I now remove a lozenge-shaped portion of the posterior lip by four cuts of the scissors. The first two cuts divide the edge of the os at the same point in the median line, but at the other end are from a quarter to a third of an inch

apart, the next two cuts start at the extremities of the other two and meet in the median line, thus removing the lozenge. The upper apex of the lozenge should be externally at or nearly at the vagino-cervical junction and internally should reach almost to the level of the angle of flexion in the individual case. Two sutures longitudinal to the vagina, one on each side of the cut, then bring the longitudinal points of the lozenge together at the cervico-vaginal junction, thus shortening the posterior lip of the cervix and yielding a straight uterine canal. After the recovery of the patient from ether the lower pole of the uterus will now be drawn strongly backward and upward by the unopposed action of the utero-sacrals, and the application of a suspension, or of any of the standard round-ligament operations to the upper pole completes the operation. There is now everything to keep the fundus forward and no opposing force to turn it backward.

Since the adoption of this procedure my percentage of failures after operations for the retrodeviations has diminished almost to the vanishing point, and I have come to feel that with this addition almost any one of the accepted operations is as good as any other.

I think that if you will treat my two main points—that abnormal anterior fixation of the cervix is the chief predisposing cause of the posterior deviations of the fundus, and that the operative release of this forward fixation of the cervix is a most potent addition to our means of combating such retroversions as need operative treatment—as hypotheses which are worthy of submission to observation and experimental use in your own daily work, you will soon be forced to the point of accepting them as established to your content, as they already are to mine.

DISCUSSION

Dr. Herman J. Boldt.—Dr. Reynolds is right in saying that "progress is usually inaugurated by prior work on theoretical considerations which underlie it." Indeed, I go further, and say that this is always the case.

He is right, too, when he says that it would be more exact to call the median Y-shaped ligament a sheet of fascia. It is so regarded by me and so spoken of when operating.

For what is called "anteflexion of the cervix" by Dr. Reynolds —and I believe by all other writers—I have been accustomed to use the term "retroversion of the cervix," considering the direction of the cervix from the position of the external opening. It is a condition which is always congenital unless caused by pelvic inflammation.

Heretofore I have always looked upon the shortened, and not infrequently indurated, condition of the sacro-uterine ligaments as being the main factor in causing this position of the cervix, and have on a number of occasions, in the last twenty years, cut the shortened ligaments to overcome the backache of which many persons so afflicted complain, several times relieving this symptom by the surgical intervention.

That the holding forward of the fundus is due to the action of the round ligaments is, in my opinion, questionable in the greater number of such instances. These ligaments are not taut except when the bladder and the rectum are full. The condition is usually an association of anteflexion of the body of the uterus with a retroversion of the cervix, and unless there be an atrophy of the anterior cervicocorporal junction, probably as a result of long standing of the condition, we will find the tissue at this junction unyielding; indurated, if I may call it so, since it is impossible to straighten it permanently by manual or mechanical means. Hence the mechanical dysmenorrhea of which many patients frequently complain. The usually presented shortened anterior vaginal wall is part of the congenital malformation, and is, of course, an additional factor in causing the retroversion of the cervix.

I have always regarded the shortened and thickened sacro-uterine ligaments to be a low-grade inflammatory process—a parametritis posterior. Furthermore, when the condition is of long standing and more or less atrophy has taken place in

the anterior part of the cervix at the flexion angle, due to long duration and not infrequently increased size of the body of the uterus, the organ cannot straighten itself by any physiological factor brought to bear upon it. We may, indeed, see the uterus assume a position farther backward in the pelvis, thus constituting a retroposition; and then the intra-abdominal pressure may cause a still more acute flexion angle.

While I am in full accord with many of the conclusions enumerated by Dr. Reynolds, I must add that in my own practice I have never encountered the development of a retroversion from the pathological condition he so accurately describes, though I have observed such patients occasionally for ten years or more.

While I admit the correctness of Dr. Reynolds' logic, I have been unable, personally, to corroborate it. But his statement that he has rarely seen a retroversion of the uterus in which the position of the cervix was not also one of anteflexion, or as I call it, "retroversion," is correct. The cases of pure retroversion, compared with cases of retroflexion with retroversion are very rare, and to this fact Bernhard Schultze called attention many years ago.

I find in most cases a combination of displacement. If we do chance to meeet a case of plain retroversion it is usually only a question of time—if nothing be done to correct the displacement before, from the greater weight of the uterine body, a more or less pronounced flexion angle will result, following the passage of the induration at the cervico-corporal junction. But I do not consider these patients in the same class with the congenital anteflexion patients, for the greater number have acquired their displacement

Neither have I found, except as the result of scar tissue, the tautness near the cervicovaginal junction that we meet with in some of the congenital cases.

While I do not assert that none of the cases of retroversioflexion has a forward fixation of the cervix, I have never observed it except in those of the congenital type. This is furthermore proved by the fact that in the greater number of instances of acquired retroversion or the acquired retroversioflexion the uterus may be anteposed and kept in anteposition by a properly adjusted mechanical support.

Only occasionally do we meet a case where this is impossible

and in which we must resort to surgical intervention to bring about a correction of the posterior displacement, if this causes symptoms. Of course if a marked degree of descensus of the uterus is associated with the backward displacement we cannot expect to do more than give palliative relief—and that not always—by mechanical support.

The operative technique made use of by Dr. Reynolds in the cases in which the cervix is fixed more or less and the vaginal wall shortened, impresses me as logical; and I purpose to make use of it when an opportunity presents itself.

Dr. I. S. Stone.—It seems to me that Dr. Reynolds' suggestion has been more or less covered in effect if we remember the Mackenrodt operation for retroversion; that is, separation of the bladder from the anterior vaginal wall, dropping forward of the body of the uterus and fixing the anterior vaginal wall to it. This will answer the same purpose and permanently overcome the retroversion.

Dr. J. Wesley Bovée.—About fifteen years ago I began doing this work. I devised surgical procedures, as some of you remember, on the lower ligaments of the uterus. I read a paper on this subject at the meeting of the American Medical Association in 1902 and another in the meeting of this Society the same year as a part of a symposium on the treatment of retroversion of the uterus. In searching the literature of the Surgeon-General's library in preparation of these papers I was surprised to find my work had been anticipated by W. H. Byford, who had shortened the uterosacral ligaments in 1878 (see fourth edition of his book, *Practical Gynecology*, 1888). Much information and inspiration were received from reading Byford on this subject. I studied the subject carefully and found that we had another characteristic in certain anomalies of development to deal with, that is, an abnormally high attachment of the uterosacral ligaments of the cervix and an abnormally low attachment of the anterior wall of the vagina, so that I realized many of these cases needed to have the defects remedied, and I did this by severing the anterior vaginal wall from the cervix, attaching it at a higher point and severing the uterosacral ligaments from the cervix and attaching it to the lower point, which changed the leverage of the anterior vaginal wall more from the junction of the cervix with the body, thus giving stronger posterior leverage on the posterior wall of the

uterus. I did that procedure in two different ways—one very much after the plan mentioned by Dr. Reynolds by detaching the anterior wall from the cervix and attaching it again higher, and the other by making a transverse incision and lengthening the anterior vaginal wall, except I added this modification: I did it with interrupted sutures, and I inserted a small amount of soft rubber (on account of oozing) into the opening between the cervix and the bladder, which was attached to a piece of gauze with suture, the gauze being placed in the vagina, and when removed, pulled the rubber drainage out. The uterosacral ligament operation was beneficial in those cases in which there was contraction of the uterosacral ligaments from inflammation such as Dr. Boldt called posterior parametritis.

I did not hear Dr. Reynolds mention whether the uterosacral ligaments were a feature in the combination which keeps the uterus in position, although he later referred to the sttong muscular tissue and strong action of the uterosacral ligaments. I can assure you from a long period of employment of this procedure that it is proper, but I wish to give due credit for the shortening of the uterosacral ligaments to Dr. Byford, Sr.

Dr. James R. Goodall.—After listening to Dr. Reynolds' paper it strikes me that two classes of cases are being placed in one category; that the type of acute anteflexion of the uterus and the type of retroflexion are two distinct types which cannot be considered as belonging to one class. For instance, if we take young girls who complain of severe dysmenorrhea, we find associated conditions of the vagina and pelvis. Associated with an acute anteflexion of the uterus there is a short anterior lip of the cervix and a long posterior lip. That type of uterus when removed from the body and held by the cervix cannot be undone. The anterior uterine wall is very fibrous in parts, and it is a type of uterus which in my experience seldom, if ever, becomes retroverted or retroflexed. That type of girl is big, muscular; she is the masculine whose physical development has gone on to an advanced stage, but the pelvic organs have remained, as it were, somewhat infantile. In the other type of case in which retroversion and retroflexion take place there is a lack of tone and a tendency to enteroptosis even before pregnancy has taken place, and with that type of uterus the fundus can be moved to and fro upon a softened isthmus. In the first type of case, with acute anteflexion, we frequently

find that the uterus is drawn into the hollow of the sacrum by shortening of the uterosacral ligaments; in the other type of case we do not get a long cervix such as we expect to find in a case of acute anteflexion. These are absolutely two different types of cases which should not come in the same class. In the one class we have tautness of the uterosacral ligaments; in the other there is a laxity of everything, and marked elongation of the uterosacral ligaments.

Dr. Edward Reynolds (closing).—It is difficult in the short time at one's disposal to go into all phases of the subject. In reply to what Dr. Bovée said, I think the difference between the release of the cervix and forcing it back as we do in the cystocele operation is that the release of the cervix involves an extremely short incision across the anterior vaginal wall, especially designed not to narrow the vagina, and the extent to which the cervix moves back is due only to a deviation of the tissues which makes a sufficiently transverse support to force it backward.

I think too, that in the majority of cases if the anterior lip is released from this fixation we get all that we want from the uterosacral ligaments without moving them down even though they are high.

With what was said relative to the importance of the uterosacral ligamets I fully coincide. My view is that if the action of the uterosacral ligaments is unopposed, everything being free, we get perhaps the main support of the uterus from the uterosacral ligaments directed upward and backward at its extreme lower pole with a tendency of the fundus to sag forward.

In reply to the remarks made by Dr. Goodall, I would say that there is a distinction between these two classes of retroverted and anteflexed uteri. Retroversion seldom occurs in the class in which the anterior wall at the angle of flexion is hard and firm, and when I began to work with Dudley's operation I was doubtful whether the anteflexion could be corrected for any purpose in that class of cervix, but experience has shown me that we can straighten the uterus by this operation even in these cases, and in answer to what Dr. Ehrenfest said about multiparæ, it requires special, careful observation to determine in the relaxed condition of multiparæ whether there is or is not a mechanical effect.

Dr. Seth C. Gordon.—In removing the lozenge-shaped portion from the posterior wall of the cervix do you not limit the canal?

Dr. Reynolds.—I do not think you do. I have done many of these operations, a good many of them for cases of sterility, and some of my friends have complained of slow dilatation of the cervix during labor in the ensuing pregnancy. In other words that it makes dilatation of the cervix difficult.

Dr. Gordon.—In the non-impregnated uterus it would limit the canal, would it not?

Dr. Reynolds.—I do not believe it would. Every obstetrician knows that the class of undeveloped cervix in which we find anteflexion is that class in which there is slow dilatation of the cervix, and if you allow for that, my own guess is that this operation does not increase the difficulty in dilatation; but, of course, that is merely a clinical guess. I do believe that if you will give this operation a fair trial as a preliminary to ordinary operations for retrodeviations of the uterus you will find that it will add to your successes.

ULTIMATE RESULTS SECURED FROM SURGICAL INTERVENTION IN SIMPLE CASES OF CHOLELITHIASIS AND IN CHOLELITHIASIS DISCOVERED DURING OPERATIONS FOR OTHER CONDITIONS

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There existed until within the last decade, a widely prevalent view, borne out by the text-books of the time, that gall-stones could be present for prolonged periods without causing any manifest disturbance of the biliary or gastric function. This presumption was based upon a fallacious interpretation of the symptoms. That cholelithiasis, or even a marked cholecystitis, may exist without presenting the so-called classic symptoms is no longer questionable. Modern surgery has shed much light upon this subject and symptoms that were formerly regarded as essential for the establishment of a diagnosis of cholelithiasis, are now looked upon as terminal, rather than initial, indications of biliary disorders.

At a meeting of the American Gynecological Society, held in Boston a decade ago, I reported several cases of cholelithiasis associated with gynecologic lesions. From a summary of the views expressed at that time I quote the following:

"1. The usual statement that 95 per cent. of gall-stones produce no symptoms is fallacious, because it is based on autopsy and dissecting-room statistics.

"2. Bile possesses no bactericidal properties, for in the majority of cases of cholelithiasis microörganisms of a more or less pathogenic nature are discovered.

"3. Under these circumstances many vague symptoms, usually attributed to gastro-intestinal or general constitutional disturbance, may arise as the result of toxins elaborated about these foreign bodies in the gall-bladder.

"4. All clinicians admit that a wide hiatus exists in the clinical symptoms between the early formation of gall-stones and the so-called classic attacks of biliary colic with jaundice.

"5. Abdominal surgeons should carefully record all gastro-intestinal or hepatic symptoms, and any other vague epigastric pains, and these should be associated with the findings secured on examination of the gall-bladder, with a view to establishing a further link in the symptomatology of cholelithiasis.

"6. As cholelithotomy has been attended, in a large series of cases, with a mortality of less than 2 per cent., the removal of gall-stones during the performance of some other abdominal operation is not too hazardous an undertaking.

"7. This coincident operation should be undertaken only as the result of most careful surgical judgement, for if the patient is in a critical condition from a prolonged operation, or if the primary operation has been done for a septic condition, this additional operative procedure may be attended by serious consequences."

That the interpretation as expressed at that time has been sustained by later findings I believe the accompanying report of 159 gall-stone cases will amply prove. Since that time I have made an even more careful study of the symptomatology of cholelithiasis, and in only a small percentage of coincidental cases were these foreign bodies found to be innocuous.

In a paper recently published under the title of "'Innocent' Gall-stones a Myth," William Mayo says:

"Ten years ago we heard a great deal about 'innocent' gall-stones, which meant that gall-stones existed without symptoms, and that their presence was not suspected until postmortem examination brought them to light. We cannot now escape the conviction that the gall-stones did cause symptoms, and that we, as diagnosticians, and not the gall-stones, were 'innocent.'"

The late Dr. Richardson, in one of his last papers, entitled "The Diagnosis and Prognosis of Gall-stone Disease from the View-point of the Surgeon," takes up the symptomatology of cholelithiasis, and shows conclusively that in many cases there is no pathognomonic group of symptoms, but that the functional derangement incident to the presence of these foreign bodies may range from vague distress to the intense, cramp-like pain which the internist is so prone to call "gastralgia." This gastralgia in itself should be regarded as a "myth." The high-sounding term may satisfy the layman, but certainly gastralgia is an infrequent symptom, exhibiting no tangible mechanical defects, and therefore it is most misleading and meaningless to both patient and physician.

Richardson expresses the view that these so-called innocent cases should be treated before they manifest the positive symptoms that indicate that an advanced stage of pathologic change has taken place in the biliary system. In his expressive style, he says: "Shall we wait for pathologic changes of serious disease to become so characteristic that diagnosis is unmistakable? Shall the trend of medical and surgical thought be toward accuracy at the expense of safety? Shall the disease come to the surgeon, or the surgeon go to the disease? Shall the lesion prevail until the surgeon, perforce, strikes a blow, or shall the surgeon

assault, overwhelm, and destroy the lesion at its very inception? Shall we take that initiative so important and so favorable in matters of war, or shall we rest on the defensive?

"The answer is simple it seems to me. With our utmost endeavor we must make our attack at the earliest possible moment, after we have with reasonable accuracy located the enemy and ascertained his resources."

This, then, is the view-point of the surgeon. Now what of the physician? Their views are divided between a conservative medical and an active surgical intervention. In general, however, many excellent practitioners still exhibit a tendency to delay surgical intervention until the classic attacks set in. Too many are still dominated by the statistics of almshouses and hold to the now largely discredited belief as to the innocuousness of gall-stones.

In a Mütter Lecture on "Infection of the Biliary Tract," delivered in 1906 before the College of Physicians, the late A. O. J. Kelly, one of the most brilliant of the younger physicians of this country, very judiciously discussed this entire question, and unhesitatingly commended the wisdom of early intervention in these cases. I quote two paragraphs from this lecture, which will tend to show the general trend of his views concerning the dangers of cholelithiasis and the results of surgical treatment. He says: "Between the extreme of innocuousness or comparative innocuousness and quick and early disaster lie the great majority of cases of biliary infection." In discussing possible failure after surgical intervention he remarks: "The fact that the operative results are not always what were hoped for is not in itself a contra-indication to operation; on the contrary, these untoward results are often attributable rather to the fact that in many long-delayed cases the anatomic lesions are such as to be almost, if not quite, irremediable by any and all means at our command."

The After-history of Cases. Surgeons during the last few years have modified many old and devised countless new operations and the immediate results of these procedures have been widely studied. The ultimate results in cancer operations have been accurately traced, and in other diseases we have ascertained the percentage possibilities of cures; in many, however, no accurate statistics as to the remote results of surgical intervention has been secured. In conjunction with my assistant, Dr. Block, I have traced with great interest the results of a very large proportion of our cases of gall-stone operations, and have set down here in tabular form, our findings. In one group are included cases in which an operation was performed for cholelithiasis without any associated gynecologic condition. In the second group we have placed those cases in which gall-stones were discovered during a gynecologic or other abdominal operation.

Of our series of 159 cases, in only 14 per cent. did we fail to secure accurate information as to the outcome. No case has been included in this list that was operated upon less than nine months previously.

Type of Operation. In our earlier practice it was our custom to suture the gall-bladder to the peritoneum of the anterior abdominal wall, thus shutting it off from the general peritoneal cavity. After considerable experience we discovered that in these cases biliary fistulas frequently healed slowly, and patients often complained of dragging or pulling pain at the site of the attachment for some time after their leaving the hospital. This method was, therefore, abandoned and now we use instead an improvised drainage-tube, which can be sutured securely into the gall-bladder. When this is done, the gall-bladder falls back into its normal position, and is not held in a constrained position against the abdominal wall. Since adopting this

plan we have observed a marked improvement in the results, as shown by the prompt closure of the drainage tract and the subsequent comfort of the patient. By this means, too, perfect drainage has been secured and in those cases in which there has been persistent postoperative nausea, the tube has served to facilitate the introduction, in a reverse way, of normal saline solution into the duodenum, as was recommended by McArthur. In all cases in which nausea persists after twenty-four hours, we attach a saline reservoir to the drainage-tube, and under one foot of hydraulic pressure permit the fluid to drop slowly into the gall-bladder. Great care must be observed to avoid the slightest excess of pressure, which might induce a rupture about the point of insertion of the tube in the gall-bladder.

In our series of cases the drainage was usually maintained for ten days. This rule is, however, an arbitrary one, and in some cases the drainage period may be extended.

Within the last two years we have resorted to cholecystectomy in a greater proportion of cases, for experience has shown that if the wall of the gall-bladder is thick and indurated; or if it is dilated and very thin; or on inspection of the interior of the organ, the mucosa is found to be eroded or exhibits a strawberry mottling, cholecystectomy is the operation of choice. In those cases in which there are few or no symptoms, we have found that the removal of gall-stones, with a ten days' drainage, is followed by complete recovery and that there are no postoperative sequelæ. When, on the other hand, the gall-stones have caused more or less extensive pathologic changes, the outcome, so far as complete recovery is concerned, may be very unsatisfactory. Under such circumstances the patient continues to complain, and subsequent removal of the gall-bladder may be necessary.

From a study of the after-histories of these cases we are

convinced of the necessity for resorting more frequently to cholecystectomy. Occasionally we have closed the gall-bladder after the removal of uncomplicated gall-stones, but we prefer to use a simple drain, thus obviating all danger of rupture of the gall-bladder and escape of bile into the peritoneal cavity.

From a review of this series of cases we conclude that:

1. Simple drainage is all that is necessary in cases of cholelithiasis in which there are no symptoms attributable to the presence of the stones.

2. When the gall-bladder is thickened or greatly dilated, or if it is the seat of the so-called "strawberry change," as described by Moynihan, cholecystectomy should be the operation of choice.

Through this analytic study of cases we have gained greatly in our knowledge of the best methods of dealing with the various lesions incident to gall-stones. Certainly mere drainage does not, as we formerly believed, cure every case of cholecystitis.

As to So-called "Reflex Gastralgia," "Indigestion," and "Dyspepsia." These terms are given prominence here in the hope that they will serve as a target for immediate demolition. In our series of cases many patients were referred to the gynecological wards for the repair of a lacerated cervix or perineum, or for the correction of a retroversion of the uterus, who exhibited clearly defined symptoms referable to the upper abdomen that were considered by the family physician as reflex manifestations, although an accurately traced history would have left no doubt as to their true significance. I am a pronounced pessimist as regards the belief that reflex symptoms in the upper abdomen emanate from gynecologic lesions. In our teaching we constantly lay stress upon this point: "Locate your symptoms anatomically and then seek for

the lesion in that locality." If this quest fails, then one may extend the diagnostic excursion to immediate or more remote organs.

In a very interesting case that came under our care recently the patient had suffered three years previously from characteristic attacks of gall-stone colic. A cervical laceration, which was considered to be the reflex source of these attacks, had been repaired in a suburban hospital, the patient having been kept in bed for three weeks. The recovery was prompt and the cure apparently complete. All symptoms in the upper abdomen ceased—a triumph for this antiquated doctrine. A second baby was born and this was followed by a prompt return of the old symptoms. A small laceration had again occurred, and the patient's physician referred her to the gynecologic department for relief of the condition by repair of the trivial laceration. Both physician and patient objected strenuously to even an exploration of the gall-bladder, and only when we refused to proceed with the operation without their permission was the request to explore acceded to. As a result, two hundred stones were found in the gall-bladder. Following the first operation, the period of rest in bed had evidently brought about a quiescence of the gall-bladder symptoms, and only after the second pregnancy did they again become active. Many similar cases have occurred in our practice.

Latent gall-stones frequently become active subsequent to parturition. This is due I believe, to the lessening of intra-abdominal pressure, with sagging of the gall-bladder and liver, thus causing a stagnation of bile, and precipitating an attack of cholecystitis. As a much larger percentage of gall-stones occur in child-bearing women than in those who have never been pregnant, and also because a larger percentage occur in women than in men, the gynecologist should be specially alert in studying the symptoms

incident to disease of the organs of the upper abdomen. Serious error is especially likely to lurk within the shadow of a reflex doctrine, casting grave discredit upon the science of gynecology.

In gynecologic cases manifesting coincident symptoms in the upper abdomen the gall-bladder, by far more frequently than any other organ is the seat of disease. In a vastly larger series of gynecologic cases gastric or duodenal ulcers or gastric carcinoma have been found so infrequently as to be regarded as almost negligible. Therefore when the upper abdominal symptoms are vague, and the possibility of diseases of the pylorus, duodenum and gall-bladder is considered, the ratio of incidence is greatly in favor of the gall-bladder as the seat of the trouble. In our own cases the ratio is at least 100 to 1. In doubtful cases, the diagnosis should invariably be cholelithiasis or cholecystitis with the possibility of some one of these other lesions far in the background.

When should gall-stones be removed as an incidental part of a gynecologic operation? We still adhere to the precautions laid down ten years ago; namely, that the coincident operation should be performed only as the result of careful surgical judgment, for, as stated previously, if the patient is in a critical condition from a prolonged operation, or if the primary operation has been a septic one, this additional surgical procedure may be attended by serious results.

Our series does not include a case in which stones were removed or even searched for if a septic focus existed in the pelvis. In every instance in which there is a record of a coincident operation for gall-stones having been performed in an inflammatory condition, this was done when the chronic stage had been reached and all activity had disappeared. A coincident operation is never performed in a

purulent case, even if there are decided symptoms of cholelithiasis.

In estimating the immediate and remote results of these combined operations, we have arranged our cases under three separate headings: First, simple gall-bladder cases, *i. e.*, those in which the surgical treatment was directed solely to the relief of the cholelithiasis; second, gynecologic cases in which there were unmistakable symptoms of associated gall-bladder disturbance; and third, those cases in which some pelvic operation was performed and gall-stones were accidentally discovered.

So far as the immediate mortality is concerned, the first group, consisting of 55 cases, was attended by an immediate mortality of 4.3 per cent.; the second, by 7 per cent.; and in the third no fatality occurred.

As would naturally be expected, the possibility of wound infection is proportionately greater when two or more operations are performed; first, because of the greater number of surgical incisions, which, of course, increase the risk, and second, the greater hazard, in changing from one operation to another, of possible defects in technique. To overcome these dangers, separate sets of instruments and rubber gloves should be employed in each new operation. So far as the instruments are concerned, there is nothing fraught with so much danger as the repeated use of the surgical needle. In a simple hysterectomy, for example, a needle used in closing the uterine stump should be discarded, for there is always danger of it becoming contaminated from passage through the cervical canal; if this has occurred, it may, if used again, infect a fresh wound.

In these combined operations the greatest care should be observed in changing from one operative field to another. We never employ in the pelvic zone any of the instruments used in a plastic operation and the same precaution should

be observed in the performance of a third operation in the upper abdomen.

Notwithstanding these precautions, our series of combined operations has shown a higher percentage of wound infections than the simple gall-bladder operations, in which the percentage of wound infections was 5.9; in the combined operations the rate was 9.7 per cent. in one series and 9 per cent. in the other. These figures cover any degree of wound infection from a small point to an extensive break in the wound. Another point to remember is that the greater the length of time consumed in these operations, the more likely to arise are untoward complications during convalescence. Thus postoperative vomiting and phlebitis are observed in larger degree in the combined operations. Pneumonia occurred only once in the entire series of cases.

In these days when hospital efficiency is arousing so much agitation, the number of days a patient spends in a hospital must be accounted for. In some hospitals the tendency has been to hasten convalescence, or, rather, to expedite the discharge of patients from the hospital. The test of efficiency should be the ultimate result secured, and not the brevity of the sojourn in the hospital. I believe that a too early discharge of a debilitated or greatly enfeebled patient may lead to utter failure so far as the ultimate recovery is concerned. In free wards the personal equation must be most carefully estimated. In the case of a farmer's sturdy wife rapid convalescence may ensue after an early return home; in another instance if the patient lives in cramped quarters where the ventilation is poor and the food wretched, to hurry her home is to bring the final results into jeopardy.

In convalescence after surgical operations we have found the so-called neurasthenia to occur chiefly at the two ex-

tremes of the social scale—the pampered rich and the sorely impoverished. In the latter case the patient may never rise above the wretched environment unless she is well on the road to convalescence before she is discharged from the hospital. Further, we hold that no patient should be permitted to return to her home who possesses any disabling surgical complication. The psychic handicap to such a woman may frequently be quite insuperable. In cases of cholelithiasis, we prefer, if possible, to keep our patients in the hospital until the fistula is closed, especially if they are not to be under our supervision after they leave the institution. In general, under the plan we now pursue, from eighteen to twenty-one days is the usual length of time these patients remain in the hospital.

The *causes of death* in our cases were as follows:

Case I.—Cholangitis, which was produced by stones blocking the hepatic radicles in the liver substance, and pancreatitis, produced by a calculus that had ulcerated its way into the pancreas from the common duct. These stones were not discovered at the operation.

Case II.—Extensive cystic destruction of the pancreas with chronic cholecystitis; death occurring from cholemia seventeen days later.

Case III.—Umbilical hernia and chronic cholecystitis; death occurring from cholemia five days after operation. The output of bile steadily diminished, until it finally ceased entirely.

Case IV.—Advanced pancreatitis with cholelithiasis; death from cholemia nineteen days after operation.

Case V.—Cholecystitis, probable leakage about gall-bladder drain; death from a subphrenic abscess thirty-one days later.

Case VI.—Chronic metritis with densely adherent tubes and ovaries, Lane's kink, concretion in appendix, and

cholelithiasis. Hysterectomy, release of Lane's kink, appendectomy, and cholelithotomy were done. Death occurred from peritonitis five days later.

In summing up these cases we observe that four of the cases died from the destructive results of advanced cholelithiasis. In only two could death be attributed to any defect in the operative technique. In one there was a leakage with the formation of a subphrenic abscess; in the other, a peritonitis. It is possible that these two deaths might have been avoided.

The point that the first four fatalities should drive home is that when pancreatitis of a chronic type supervene the biliary condition sinks into insignificance beside the grave dangers that threaten from this sequel. In these cases the surgical mortality is extremely high. In none of the combined operations in which there were no symptoms attributable to gall-stones did a fatality occur.

Ultimate Results. A. *Cases of Cholelithiasis Unassociated with Other Abdominal or Gynecologic Lesions.* Of our series of 54 gall-stone operations not associated with other gynecologic or abdominal conditions, 84 per cent. of results were traced. No case returned for a second operation, and none had been operated upon elsewhere.

Of this number 69.5 per cent. were cured, 15.2 per cent. were greatly improved, and 2.1 per cent. were not improved. Of the entire number, 8.6 per cent. died after leaving the hospital from extraneous conditions not connected with the surgical operation.

B. *Cases of Cholelithiasis with Symptoms Associated with Other Abdominal or Gynecologic Lesions* (*seventy-three cases*). Of this number, 78 per cent. were traced; 59.7 per cent. were cured, 17.5 per cent. were greatly improved, 1.7 per cent. were slightly improved, and 8.7 per cent. were unimproved. Since leaving the hospital, 3.5 per cent. died

of intercurrent diseases not connected with the biliary operation.

C. *Cases of Cholelithiasis without Assignable Symptoms Associated with other Abdominal or Gynecologic Conditions* (*thirty-one cases*). Of this number 86 per cent. were traced, 64 per cent. were cured, 16 per cent. were greatly improved, 4 per cent. were slightly improved, and 8 per cent. (2 cases—both excessively neurotic) were worse than they had been before operation.

It is especially noteworthy that in the second class of cases, where there were unquestionable symptoms of diseases of the upper abdominal organs, in 13 there were visible changes in the appendices, ranging from mild to acute inflammations. Thus the error in diagnosis falls chiefly between appendicitis and cholecystitis. In several of these cases the condition of the appendix gave rise to the acute symptoms which had precipitated the operation.

From this analysis we learn that the worst results occur among the combined cases in which there are manifest symptoms due to biliary changes. The ratio of the cures is in direct proportion to the severity of the symptoms. The weight of evidence most emphatically favors the early removal of gall-stones. The mortality will be very small, the proportion of cures very large, and the hazard of a return of the patient to the hospital for a second operation very slight. In the light of the results secured in this larger series of cases we believe that our stand of a decade ago, which favors the removal of gall-stones associated with other gynecologic or abdominal lesions, whether they are producing symptoms or not, is amply sustained.

In the following summaries of case histories all patients have been accurately traced, and the final results as tabulated were obtained within two months of the preparation of this paper.

TABLE I.—Combined Operations with Gall-bladder Symptoms.
By FRANK B. BLOCK, M.D.

	No. of patients.	Days in hospital.	Convalescence.	Returned for second operation.	Cures.	Great improvement.	Slight improvement.	Unimproved.	Worse.	Death.
Displacement	25	29	Vomiting, 1 Phlebitis, 1 Infection, 2	2	10	2	1	2	0	4; 2 incident to operation.
Appendix . .	13	29	Vomiting, 1 Phlebitis, 1 Infection, 1	3	6	1	0	3	0	0
Fibroid . .	12	32	Infection, 3 Pneumonia, 1	1	9	3	0	0	0	0
Pelvic inflammation	9	27	.....	0	3	2	0	0	0	1 (peritonitis).
Ovarian cyst .	7	28	.....	1	3	0	0	0	0	0
Hernia (umbilical and ventrical)	4	26	Vomiting, 1 Infection, 1	0	2	0	0	0	0	2 (cholemia).
Stricture of rectum . .	1	29	.....	0	0	1	0	0	0	0
Carcinoma of uterus . .	1	27	.....	0	1	0	0	0	0	0
Floating kidney . .	1	28	.....	0	0	1	0	0	0	0

TABLE II.—Combined Operations Without Gall-bladder Symptoms.
By FRANK B. BLOCK, M.D.

	No. of patients.	Days in hospital.	Convalescence.	Returned for second operation.	Cures.	Great improvement.	Slight improvement	Unimproved.	Worse.	Death.
Fibroid . .	14	30	Vomiting, 2 Phlebitis, 1 Infection, 2	0	8	4	0	0	0	0
Displacement	5	25	.....	0	1	0	0	0	2	0
Ovarian cyst	5	33	Cystitis, 1	0	3	0	0	0	0	1 (two years later; cause unknown).
Pelvic inflammation	3	25	Infection, 1	0	1	1	0	0	0	0
Displacement and hernia	2	24	....	0	2	0	0	0	0	0
Appendix . .	1	18	.....	0	0	0	1	0	0	0
Cervical polyp	1	48	.....	0	0	0	0	0	0	1 (cerebral hemorrhage six years later).

TABLE III.—Comparative Statement of Simple and Combined Gall-bladder Operations.

By FRANK B. BLOCK, M.D.

	Simple gall-bladder operations.	Combined operations with gall-bladder symptoms.	Combined operations without gall-bladder symptoms.	Total.
Number of cases	55	73	31	159
Percentage of cases traced	84.0 per cent.	78.0 per cent.	86.0 per cent.	86.0 per cent.
Average age of patients	42 years.	39 years.	44 years.	41.7 years.
Average number of days in hospital	29.4	28.6	29	29
Complications of convalescence:				
Infection	5.9 per cent.	9.0 per cent.	9.7 per cent.	8.2 per cent.
Prolonged vomiting	.0	4.0 per cent.	6.4 per cent.	3.1 per cent.
Phlebitis	2.0 per cent.	2.6 per cent.	3.2 per cent.	2.5 per cent.
Pneumonia	.0	1.3 per cent.	.0	.6 per cent.
Returned for second operation	.0	9.5 per cent.	.0	4.4 per cent.
Postoperative history:				
Cured	69.5 per cent.	59.7 per cent.	64.0 per cent.	63.8 per cent.
Great improvement	15.2 per cent.	17.5 per cent.	16.0 per cent.	16.1 per cent.
Slight improvement	.0	1.7 per cent.	4.0 per cent.	1.5 per cent.
Unimproved	2.1 per cent.	8.7 per cent.	.0	4.6 per cent.
Worse	.0	.0	8.0 per cent.	1.5 per cent.
Died:				
In hospital	4.3 per cent.	7.0 per cent.	0	4.6 per cent.
Outside hospital, incident to operation	.0	1.7 per cent.	0	.7 per cent.
Independent of operation subsequent to discharge from hospital	8.6 per cent.	3.5 per cent.	8.0 per cent.	6.1 per cent.

Table IV.—Summary of Case Histories
By Frank B. Block, M.D.

SIMPLE GALL-BLADDER OPERATION

Gyn. No. 95. April 19, 1900. Aged forty-seven years. *Symptoms*—indigestion, four years; flatulence; dragging pain after eating; colic; vomiting. *Clinical diagnosis*—cholelithiasis; intestinal adhesions. *Operation*—cholecystotomy; release of adhesions. *Convalescence*—normal; in hospital thirty-two days. *Postoperative history*—complete cure.

Gyn. No. 396. September 31, 1901. Aged thirty-three years. *Symptoms*—dysuria; backache; colic; jaundice; tenderness over gall-bladder; diarrhea. *Clinical diagnosis*—R. V. O.; cholelithiasis. *Pathological diagnosis*—chronic cholecystitis. *Operation*—cholecystomy. *Convalescence*—normal; in hospital thirty-two days; *Postoperative history*—cannot locate.

Gyn. No. 552. April 10, 1902. Age not given. *Symptoms*—not given. *Clinical diagnosis*—cholelithiasis; abdominal adhesions. *Pathological diagnosis*—gall-stones. *Operation*—cholecystostomy. *Convalescence*—stitch abscess; in hospital thirty-seven days. *Postoperative history*—complete cure.

Gyn. No. 887. April 17, 1903. Aged twenty-two years. *Symptoms*—colic, three years. *Clinical diagnosis*—cholelithiasis. *Operation*—cholelithotomy. *Convalescence*—stitch abscess; in hospital thirty-six days. *Postoperative history*—cured.

Gyn. No. 1083. November 23, 1903. Aged fifty-one years. *Symptoms*—colic and jaundice; two years; pain in hepatic region. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—cholelithiasis; cholangitis; chronic pancreatitis. See autopsy report. *Operation*—partial cholecystectomy. *Convalescence*—continual nausea, vomiting and prostration; death on thirtieth day. *Postoperative history*—autopsy; stones in pancreatic duct and hepatic radicles.

Gyn. No. 1118. December 29, 1903. Aged forty-nine years. *Symptoms*—indigestion, fifteen years; colic; clay stools. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholelithotomy. *Convalescence*—chill, $103\frac{2}{5}°$; pain in back on fourth day; passed stones in stool eleventh day; in hospital twenty-eight days. *Postoperative history*—complete recovery.

Gyn. No. 1337. October 16, 1904. Aged thirty-six years. *Symptoms*—colic, chill and sweats three years; jaundice; clay stools. *Clinical diagnosis*—cholelithiasis; pyloric adhesions. *Pathological diagnosis*—gall-stones; catarrhal cholecystitis. *Operation*—cholecystectomy. *Convalescence*—bronchitis; pleurisy; lumbar abscess (intraperitoneal); in hospital sixty days. *Postoperative history*—patient cannot be traced.

Gyn. No. 1405½. December 2, 1904. Aged thirty-seven years. *Symptoms*—colic three years; discomfort over gall-bladder. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholelithotomy. *Convalescence*—normal; in hospital thirty-nine days. *Postoperative history*—complete cure.

Gyn. No. 1469. March 21, 1905. Aged fifty-two years. *Symptoms*—gastric distress four months; jaundice; epigastric pain; vomiting. *Clinical diagnosis*—empyema of gall-bladder; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystotomy. *Convalescence*—incontinence of urine and hematuria following ethyl chloride anesthesia; in hospital fifty-six days. *Postoperative history*—complete cure.

Gyn. No. 1474. March 28, 1905. Aged twenty-six years. *Symptoms*—colic four years; vomiting. *Clinical diagnosis*—cholelithiasis; cholecystitis; intestinal adhesions. *Pathological diagnosis*—soft gall-stone material, no actual stones. *Operation*—cholecystotomy. *Convalescence*—influenza; in hospital thirty-three days. *Postoperative history*—complete cure.

Gyn. No. 1515. May 4, 1905. Aged thirty-two years. *Symptoms*—frequency of urination; backache; pains in both hypochondriac regions. *Clinical diagnosis*—cholelithiasis. *Operation*—cholecystostomy. *Convalescence*—several rises in temperature lasting a day or two at a time; in hospital forty-four days. *Postoperative history*—not located.

Gyn. No. 1576. August 10, 1905. Aged twenty-nine years. *Symptoms*—recurrence of symptoms nine months after operation; (see Case No. 950). *Clinical diagnosis*—intestinal adhesions; involving pylorus, transverse colon, and liver. *Operation*—release of adhesions to stomach and colon; excision of remains of gall-bladder. *Convalescence*—normal; in hospital twenty-six days; cured. *Postoperative history*—one year after operation had slight attacks of colic; now completely cured.

Gyn. No. 1651. November 14, 1905. Aged twenty-four years; *Symptoms*—pain in gall-bladder region and indigestion two years;

constipation; vomiting. *Clinical diagnosis*—chronic cholecystitis; ptosisof liver. *Operation*—cholecystotomy. *Convalescence*—normal; in hospital thirty-seven days. *Postoperative history*—cured of gall-bladder symptoms; died three years later following intestinal obstruction from resection of colon, not due to previous operation.

Gyn. No. 1814. May 14, 1906. Aged forty-seven years. *Symptoms*—colic, thirteen weeks; jaundice. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—gall-stones; cholecystitis. *Operation*—cholecystotomy. *Convalescence*—normal; in hospital thirty-five days. *Postoperative history*—complete cure.

Gyn. No. 1844½. May 24, 1906. Aged sixty-five years. *Symptoms*—no symptoms preceding acute onset of gangrene. *Clinical diagnosis*—cholelithiasis; gangrenous gall-bladder. *Pathological diagnosis*—acute cholecystitis; gall-stones. *Operation*—cholecystectomy. *Convalescence*—biliary fistula on discharge; in hospital thirty-five days; improved. *Postoperative history*—no recurrence of gall-bladder symptoms. Died of valvular heart disease four years after operation.

Gyn. No. 1983. November 10, 1906. Aged twenty-two years. *Symptoms*—pain in right hypochondrium three months; clay stools; vomiting; colic; jaundice. *Clinical diagnosis*—cholelithiasis; cholecystitis. *Pathological diagnosis*—chronic cholecystitis. *Operation*—cholecystotomy. *Convalescence*—normal; in hospital thirty-three days. *Postoperative history*—complete cure.

Gyn. No. 2107. March 19, 1907. Aged twelve years. *Symptoms*—attacks of colic for two years; vomiting; jaundice. *Clinical diagnosis*—cholecystitis; kinked gall-bladder. *Operation*—cholecystotomy. *Convalescence*—wound almost healed on discharge; in hospital twenty-one days. *Postoperative history*—complete cure.

Gyn. No. 2204½. May 26, 1907. Aged forty-four years. *Symptoms*—not given. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystotomy. *Convalescence*—normal; in hospital twenty-seven days. *Postoperative history*—complete cure.

Gyn. No. 2278. September 28, 1907. Aged fifty-two years. *Symptoms*—colic two months; tenderness and mass in gall-bladder area; loss in weight; has diabetes. *Clinical diagnosis*—cyst of pancreas (?); cholelithiasis. *Pathological diagnosis*—gall-stones; calcareous cyst. *Operation*—cholecystotomy; evacuation of cyst. *Convalescence*—continued nausea and vomiting; prostration; in hospital seventeen days; died of acetonemia.

Gyn. No. 2360. December 12, 1907. Aged thirty-two years. *Symptoms*—indigestion nine years; colic and jaundice lately. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—gall-stone. *Operation*—cholelithotomy. *Convalescence*—normal; in hospital fourteen days. *Postoperative history*—not located.

Gyn. No. 2483. March 31, 1908. Aged thirty-two years. *Symptoms*—jaundice; clay stools; indigestion; flatulence, one year. *Clinical diagnosis*—cholelithiasis *Pathological diagnosis*—gall-stones. *Operation*—cholecystotomy. *Convalescence*—normal; in hospital twenty-eight days. *Postoperative history*—complete cure.

Gyn. No. 2529. April 29, 1908. Aged twenty-nine years. *Symptoms*—colic, four years; vomiting. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystotomy. *Convalescence*—normal; in hospital seventeen days. *Postoperative history*—complete cure.

Gyn. No. 2378. December 31, 1907. Aged twenty-eight years. *Symptoms*—colic, two months; flatulence; vomiting. *Clinical diagnosis*—cholelithiasis. *Operation*—cholecystotomy. *Convalescence*—normal; in hospital twenty days. *Postoperative history*—complete cure.

Gyn. No. 2396. January 10, 1908. Aged forty-two years. *Symptoms*—indigestion, thirteen years; sharp pain in left hypochondrium radiating to right shoulder. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholelithotomy. *Convalescence*—gall-stone discharged from wound on thirteenth day; in hospital twenty-eight days. *Postoperative history*—improved considerably; occasional attacks of pain.

Gyn. No. 2746. November 29, 1908. Aged forty years. *Symptoms*—colic, eight years; jaundice; vomiting; clay stools. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—gall-stones; cholecystitis. *Operation*—cholecystectomy. *Convalescence*—normal; sinus on discharge; in hospital fifty-six days. *Postoperative history*—much better than before operation; has occasional attack of "bilious cramps."

Gyn. No. 2853. February 17, 1909. Aged forty-five years. *Symptoms*—loss in weight and appetite; nausea; vomiting; brown vomitus; epigastric pain. *Clinical diagnosis*—carcinoma of stomach; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystostomy; inoperable carcinoma of stomach. *Convalescence*—normal; in hospital twenty days. *Postoperative history*—died two years after operation from progressive cancer of stomach.

Gyn. No. 2898. April 15, 1909. Aged sixty-six years. *Symptoms*—colic, one and one-half years; vomiting; constipation. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—adenocarcinoma of gall-bladder, with gall-stones. *Operation*—partial cholecystectomy. *Convalescence*—normal; in hospital twenty-eight days. *Postoperative history*—not located.

Gyn. No. 2940. May 15, 1909. Aged forty-nine years. *Symptoms*—recurred six months after first operation (see Case No. 2394). *Clinical diagnosis*—Adhesions about gall-bladder; hemorrhoids. *Operation*—freeing of adhesions about gall-bladder; excision of one-half inch of fundus. *Convalescence*—tedious; occasional rise in temperature; in hospital thirty-five days; *Postoperative history*—indigestion; pain in gall-bladder area; severe headaches for sometime after operation now perfectly well.

Gyn. No. 2972. June 8, 1909. Aged thirty-seven years. *Symptoms*—colic, one year; jaundice; dark urine; flatulence; gastric irritability. *Clinical diagnosis*—cholecystitis; cholelithiasis. *Pathological diagnosis* — chronic cholecystitis. *Operation* — cholecystectomy. *Convalescence*—normal; in hospital twenty-seven days. *Postoperative history*—not located.

Gyn. No. 2998. June 22, 1909. Aged sixty years. *Symptoms*—pain in right hypochondrium, five weeks; mass over gall-bladder; jaundice; clay stools; painful urination. *Clinical diagnosis*—empyema gall-bladder; carcinoma common duct; gall-bladder and liver. *Pathological diagnosis*—carcinomatous metastasis to lymphatic gland; gall-stones. *Operation*—partial cholecystectomy; inoperable carcinoma of gall-bladder and liver. *Convalescence*—severe pain in back; in hospital twenty-two days; unimproved. *Postoperative history*—continued to decline rapidly and died nine weeks after operation.

Gyn. No. 3007. July 3, 1909. Aged forty-five years. *Symptoms*—colic, one year; epigastric pain and tenderness; nausea. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—chronic cholecystitis; gall-stones. *Operation*—cholecystectomy. *Convalescence*—phlebitis left femoral vein; in hospital twenty-four days. *Postoperative history*—great improvement; occasionally recurrence of pain.

Gyn. No. 3011. July 6, 1909. Aged fifty-five years. *Symptoms*—general abdominal discomfort. *Clinical diagnosis*—intestinal adhesions; ventral hernia; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystostomy. *Convalescence*—stitch

abscess; in hospital thirty-nine days. *Postoperative history*—slow convalescence; complete cure.

Gyn. No. 3061. September 28, 1909. Aged sixty-five years. *Symptoms*—sciatica, three years; dizziness; nausea; swelling in right hypochondrium; clay-colored stools. *Clinical diagnosis*—cholelithiasis; hydrops of gall-bladder. *Pathological diagnosis*—chronic cholecystitis; gall-stones. *Operation*—cholecystectomy. *Convalescence*—normal; in hospital thirty-six days. *Postoperative history*—complete cure.

Gyn. No. 3266. April 4, 1910. Aged fifty-four years. *Symptoms*—colic, ten months; occasional vomiting. *Clinical diagnosis*—cholelithiasis; chronic cholecystitis. *Pathological diagnosis*—chronic cholecystitis; gall-stones. *Operation*—cholecystectomy. *Convalescence*—normal; in hospital twenty-two days. *Postoperative history*—complete cure.

Gyn. No. 3497. October 26, 1910. Aged forty-three years. *Symptoms*—colic, thirty years; vomiting; flatulence; jaundice; dark urine. *Clinical diagnosis*—gangrenous cholecystitis; cholelithiasis. *Pathological diagnosis*—chronic cholecystitis; gall-stones. *Operation*—cholecystectomy. *Convalescence*—slight septic temperature during convalescence; in hospital thirty-one days. *Postoperative history*—complete cure.

Gyn. No. 3635. February 16, 1911. Aged forty-six years. *Symptoms*—jaundice; vomiting; clay stools, six months. *Clinical diagnosis*—cholecystitis. *Operation*—cholecystostomy. *Convalescence*—slight septic temperature; in hospital twenty-one days. *Postoperative history*—complete cure.

Gyn. No. 3756. May 25, 1911. Aged fifty-two years. *Symptoms*—indigestion, four years; pain over gall-bladder; flatulence; colic; jaundice; vomiting; clay stools. *Clinical diagnosis*—cholecystitis. *Pathological diagnosis*—chronic cholecystitis; gall-stones. *Operation*—cholecystectomy. *Convalescence*—normal; in hospital twenty-three days. *Postoperative history*—complete cure.

Gyn. No. 3758. May 26, 1911. Aged twenty-four years. *Symptoms*—colic; mucous fistula since operation (see Case No. 3666). *Clinical diagnosis*—chronic cholecystitis. *Operation*—cholecystectomy. *Convalescence*—normal; in hospital seventeen days. *Postoperative history*—complete cure.

Gyn. No. 3847½. August 20, 1911. Aged thirty-eight years. *Symptoms*—colic, nine years; gastric irritatibility; jaundice; vomiting; chill *Clinical diagnosis*—cholelithiasis. *Pathologiral diag-*

nosis—chronic cholecystitis; gall-stones. *Operation*—cholecystectomy; *Convalescence*—marked postoperative shock; in hospital twenty-two days. *Postoperative history*—complete cure.

Gyn. No. 3961. November 13, 1911. Aged forty-six years. *Symptoms*—pain in gall-bladder region (see Case No. 2864½). *Clinical diagnosis*—chronic pericholecystitis. *Pathological diagnosis*—chronic cholecystitis. *Operation*—cholecystectomy. *Convalescence*—normal; in hospital nineteen days. *Postoperative history* (see Case No. 2864½). Pain in gall-bladder incision and gastric area; considerable hyperacidity.

Gyn. No. 3991. December 4, 1911. Aged twenty-nine years *Symptoms*—colicky pain in gall-bladder region (see Case No. 3445). *Clinical diagnosis*—chronic cholecystitis; pericholecystitis. *Pathological diagnosis*—chronic cholecystitis. *Operation*—Chole. cystectomy. *Convalescence*—stitch discharged through sinus; in hospital thirty days. *Postoperative history*—complete cure.

Gyn. No. 4143. March 27, 1912. Aged sixty-six years. *Symptoms*—indigestion forty-eight years; colic; jaundice; loss in weight. *Clinical diagnosis*—cholelithiasis; chronic cholecystitis; chronic pancreatitis. *Pathological diagnosis*—chronic cholecystitis. *Operation*—cholecystectomy. *Convalescence*—dizzy spells (myocardial); in hospital twenty-three days. *Postoperative history*—complete cure.

Gyn. No. 4146. April 1, 1912. Aged forty years. *Symptoms*—soreness in abdomen; increases by urination; duration seven years. *Clinical diagnosis*—cholelithiasis; kink of right ureter. *Operation*—cholecystectomy; exploratory incision over right kidney. *Convalescence*—febrile (slight); in hospital thirty-three days. *Postoperative history*—improved; no colic; complains of pain and fulness in incision, probably hernia.

Gyn. No. 4223. May 20, 1912. Aged thirty-six years. *Symptoms*—colic, six years; vomiting; jaundice; chills; fever. *Clinical diagnosis*—tuberculous cholecystitis; pericholecystitis; tuberculosis of liver. *Pathological diagnosis*—tuberculous cholecystitis; tuberculous perihepatitis. *Operation*—cholecystectomy; choledochotomy. *Convalescence*—superficial sinus on discharge; in hospital twenty-five days. *Postoperative history*—not traced.

Gyn. No. 4283. August 6, 1912. Aged twenty-seven years. *Symptoms*—typhoid; cholecystitis with empyema; typhoid, one month ago; colic since then with vomiting; constipation. *Clinical diagnosis*—cholelithiasis; empyema of gall-bladder; chronic chole-

cystitis. *Pathological diagnosis*—chronic cholecystitis; gall-stones; normal appendix. *Operation*—cholecystectomy. *Convalescence*—normal except slight sinus on discharge; in hospital twenty-four days. *Postoperative history*—complete recovery; complains of slight pain over incision.

Gyn. No. 4355. September 19, 1912. Aged fifty-six years. *Symptoms*—pain over gall-bladder, sixteen years; colic; vomiting; jaundice. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—chronic cholecystitis; gall-stones. *Operation*—cholecystectomy. *Convalescence*—normal; in hospital twenty-six days. *Postoperative history*—great improvement; no colic; soreness under shoulder-blade; somnolence.

Gyn. No. 4422. October 31, 1912. Aged thirty-eight years. *Symptoms*—colic, five years; vomiting; flatulence. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystectomy. *Convalescence*—small sinus on discharge; in hospital twenty days. *Postoperative history*—recurrence of colic two to three weeks after operation followed by complete recovery.

Gyn. No. 4550. January 21, 1913. Aged forty-eight years. *Symptoms*—epigastric fulness for two years; flatulence; loss in weight. *Clinical diagnosis*—cholelithiasis; pericholecystitis. *Pathological diagnosis*—chronic cholecystitis; gall-stones. *Operation*—cholecystectomy. *Convalescence*—normal; in hospital seventeen days. *Postoperative history*—not traced.

Gyn. No. 4565. January 29, 1913. Aged forty-six years. *Symptoms*—colic, two years; vomiting; dark urine. *Clincial diagnosis*—cholelithiasis; chronic pancreatitis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystostomy. *Convalescence*—normal; in hospital twenty-eight days. *Postoperative history*—complete cure.

Gyn. No. 4593. February 19, 1913. Aged forty-one years. *Symptoms*—indigestion and colic, two years; slight nausea; vomiting and jaundice. *Clinical diagnosis*—cholelithiasis. *Operation*—cholecystostomy. *Convalescence*—normal; in hospital twenty-four days. *Postoperative history*—complete cure.

Gyn. No. 4608½. February 28, 1913. *Symptoms*—not given. *Clinical diagnosis*—cholecystitis. *Pathological diagnosis*—chronic cholecystitis; gall-stones. *Operation*—cholecystostomy; choledochotomy. *Convalescence*—normal; in hospital twenty-four days. *Postoperative history*—complete cure.

Gyn. No. 4800. July 8, 1913. Aged thirty-eight years. *Symp-*

toms—colic, one and one-half years; vomiting; jaundice; constipation; indigestion. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystostomy. *Convalescence*—normal; in hospital twenty-two days. *Postoperative history*—marked improvement; no colic; has constipation and pain in back.

Gyn. No. 4806. July 11, 1913. Aged forty-three years. *Symptoms*—indigestion ten years; dull pain in epigastrium; flatulence; constipation; loss of support from below. *Clinical diagnosis*—cholelithiasis; pericholecystitis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystostomy. *Convalescence*—normal; in hospital twenty-seven days. *Postoperative history*—cured of gall-stone symptoms. Condition did not permit plastic operation; will return for this later.

Gyn. No. 4828. August 21, 1913. *Symptoms*—indigestion and gall-bladder pain. *Clinical diagnosis*—cholecystitis. *Pathological diagnosis*—chronic cholecystitis. *Operation*—cholecystotomy. *Convalescence*—normal; in hospital fourteen days. *Postoperative history*—complete cure; gained twenty pounds.

Gyn. No. 4832. August 27, 1913. Aged forty-nine years. *Symptoms*—colic, twenty years; vomiting. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—chronic cholecystitis. *Operation*—cholecystostomy. *Convalescence*—attack of indigestion twenty-second day; in hospital twenty-six days. *Postoperative history*—considerable improvement, although she has recurring symptoms of a lighter degree.

COMBINED OPERATIONS WITH GALL-BLADDER SYMPTOMS

Gyn. No. 368. September 2, 1901. Aged forty-five years. *Symptoms*—biliary colic, sixteen years; prolapsus uteri. *Clinical diagnosis*—R. V. O.; cholelithiasis; retroflexion; prolapsus. *Pathological diagnosis*—endometritis cervicis. *Operation*—cholecystotomy; plastic, suspension. *Convalescence*—distention and vomiting three days; in hospital thirty days. *Postoperative history*—complete cure.

Gyn. No. 583. May 12, 1902. Aged twenty-seven years. *Symptoms*—backache; pain in lower abdomen. *Clinical diagnosis*—cholelithiasis; intestinal adhesions. *Pathological diagnosis*—gall-stones; periappendicitis. *Operation*—cholecystostomy; release of adhesions; appendectomy. *Convalescence*—constipation; in hospital

seventy-one days; improved. *Postoperative history*—unimproved; intense neurasthenia.

Gyn. No. 600. May 21, 1902. Aged forty years. *Symptoms*—colic, three attacks in past year; jaundiced; abdominal tumor. *Clinical diagnosis*—right ovarian cyst; cholelithiasis. *Pathological diagnosis*—gall-stones; cystadenoma ovarii pseudomucinosum glandulare. *Operation*—cholecystostomy; right salpingo-oöphorectomy. *Convalescence*—normal; in hospital twenty-five days. *Postoperative history*—not traced.

Gyn. 898. April 26, 1903. Aged thirty-six years. *Symptoms*—pain after urination; dragging pain; indigestion; colic; jaundice; clay stools. *Clinical diagnosis*—cholelithiasis; tubo-ovarian abscess. *Pathological diagnosis*—acute suppurative salpingitis; gall-stones. *Operation*—left salpingo-oöphorectomy. *Convalescence*—chill, 103½° F. Jaundice on fourth day; gone on seventh day; in hospital thirty-six days. *Postoperative history*—not traced.

Gyn. No. 950. June 20, 1903. Aged twenty-eight years. *Symptoms*—colic four years; tenderness over gall-bladder. *Clinical diagnosis*—cholelithiasis; parovarian cyst; erosion of cervix. *Pathological diagnosis*—endometritis cervicis. *Operation*—partial cholecystectomy; plastic; cystectomy. *Convalescence*—normal; in hospital twenty-five days. *Postoperative history*—returned for second operation (see Case No. 1576).

Gyn. No. 1069. November 1, 1903. Aged thirty-eight years. *Symptoms*—epigastric pain; indigestion. *Clinical diagnosis*—retroversion; cholelithiasis; cystic gall-bladder; R. V. O.; diastasis recti. *Pathological diagnosis*—gall-stones. *Operation*—cholecystectomy; suspension. *Convalescence*—adherent cicatrix; in hospital thirty-five days. *Postoperative history*—died of intestinal obstruction several months later.

Gyn. No. 1074. November 4, 1903. Aged forty-three years. *Symptoms*—pain over gall-bladder for three years; abdominal cramps before menstruation; one attack of colic. *Clinical diagnosis*—uterine fibroid; cholecystitis; empyema of gall-bladder; cholelithiasis; chronic appendicitis. *Pathologiral diagnosis*—fibromyoma uteri; chronic appendicitis; purulent cholecystitis; gall-stones. *Operation*—hysterectomy; appendectomy; cholecystectomy. *Convalescence*—normal; in hospital thirty-two days. *Postoperative history*—complete cure.

Gyn. No. 1105. December 11, 1903. Aged thirty years. *Symptoms*—indigestion; pain in eipgastrium and vomiting for five years;

attacks of pain right iliac fossa. *Clinical diagnosis*—right ovarian cyst; cholelithiasis. *Pathological diagnosis*—gall-stones; corpus luteum cyst. *Operation*—cholelithotomy; right oöphorectomy. *Convalescence*—normal; in hospital thirty-one days. *Postoperative history*—slow convalescence; incapacitated for one year; now perfectly well.

Gyn. No. 1152. February 7, 1904. Age not given. *Symptoms*—dysmenorrhea; abdominal pain for two years. *Clinical diagnosis*—appendicitis; metritis; cholelithiasis. *Pathological diagnosis*—hyperplasia of uterus; interstitial endometritis; obliterative appendicitis. *Operation*—hysterectomy; appendectomy; cholelithotomy. *Convalescence*—wound infection; in hospital thirty-three days. *Postoperative history*—not traced.

Gyn. No. 1197. March 24, 1904. Aged twenty-eight years. *Symptoms*—indigestion for twelve years; colic; vomiting; flatulence. *Clinical diagnosis*—cholelithiasis; chronic appendicitis. *Pathological diagnosis*—chronic appendicitis. *Operation*—cholelithotomy; appendectomy. *Convalescence*—several stones washed out on eighth day; prolonged postoperative vomiting; in hospital thirty-six days. *Postoperative history*—great improvement; has nervous indigestion; considers operative result very successful.

Gyn. No. 1335. October 11, 1904. Aged forty-four years. *Symptoms*—colic with nausea and vomiting, eight years; clay stools; jaundice. *Clinical diagnosis*—cholecystitis; R. V. O.; lacerated cervix. *Operation*—plastic; cholecystotomy. *Convalescence*— normal; in hospital forty-five days. *Postoperative history*—well for eight years; then cholecystenterostomy was performed for intense jaundice from occlusion of common duct; died May 13, 1913; cancer (?).

Gyn. No. 1516. May 4, 1905. Aged fifty-six years. *Symptoms*—metrorrhagia, one year; frequency of urination. *Clinical diagnosis*—cholelithiasis; cervical polyp; lipoma of vulva. *Pathological diagnosis*—gall-stones; lipoma of vulva. *Operation*—cholecystectomy; removal of cervical polyp. *Convalescence*—biliary fistula on discharge; in hospital forty-eight days; improved. *Postoperative history*—complete cure; died six years later from cerebral hemorrhage.

Gyn. No. 1899. August 24, 1906. Aged thirty-one years. *Symptoms*—colic, seven years; constant dull pain; vomiting. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—chronic appendicitis; gall-stones. *Operation*—cholelithotomy; appendec-

tomy. *Convalescence*—"sticking pain" in incision; in hospital twenty-eight days. *Postoperative history*—unimproved; reoperated upon elsewhere for adhesions.

Gyn. No. 1934. September 25, 1906. Aged thirty-six years. *Symptoms*—indigestion; frequent attacks of pain in gall-bladder region; has lost control of rectum. *Clinical diagnosis*—cholelithiasis; stricture of rectum by adhesions. *Pathological diagnosis*—chronic cholecystitis; gall-stones. *Operation*—cholecystectomy; cutting band in rectum. *Convalescence*—normal; in hospital twenty-nine days. *Postoperative history*—great improvement; recurrent attacks of indigestion.

Gyn. No. 2108. March 19, 1907. Aged fifty-four years. *Symptoms*—colic, two years; jaundice; vomiting; pain lower abdomen; bloody vaginal discharge. *Clinical diagnosis*—cholelithiasis; multiple fibroids. *Pathological diagnosis*—fibromyoma uteri; gall-stones. *Operation*—cholecystotomy; hysterectomy; bilateral salpingo-oöphorectomy. *Convalescence*—normal; in hospital thirty-nine days. *Postoperative history*—complete cure.

Gyn. No. 2218. July 1, 1907. Aged twenty-two years. *Symptoms*—colic, three and one-half years; vomiting; bearing down pains; cramps before menstruation. *Clinical diagnosis*—R. V. O.; retroversion; cholelithiasis; fibromyoma of rectus muscle. *Pathological diagnosis*—fibromyoma rectus abdominalis; gall-stone. *Operation*—cholecystotomy; plastic; suspension. *Convalescence*—phlebitis of femoral vein; feverish convalescence; poor drainage; persistent sinus; in hospital thirty-eight days. *Postoperative history*—not traced.

Gyn. No. 2349. November 27, 1907. Aged fifty-six years. *Symptoms*—nausea and vomiting after meals for seven weeks; pain in abdomen; intense prostration. *Clinical diagnosis*—umbilical hernia; cholelithiasis. *Operation*—cholelithotomy; herniorrhaphy. *Convalescence*—stupor and death; in hospital eleven days. *Postoperative history*—died from cholemia.

Gyn. No. 2518. April 20, 1908. Aged thirty-five years. *Symptoms*—backache; indigestion, one year; pain in epigastrium; vomiting; jaundice; colic; clay stools. *Clinical diagnosis*—right dermoid cyst; hematoma left ovary; cholelithiasis. *Pathological diagnosis*—ovarian teritoma; gall-stones. *Operation*—cholecystotomy; right salpingo-oöphorectomy. *Convalescence*—patient pulled drainage-tube out second day; no harmful result; postoperative fever; in hospital thirty-three days. *Postoperative history*—complete cure.

Gyn. No. 2737. November 19, 1908. Aged twenty-eight years. *Symptoms*—vaginal bleeding, one week; colic two weeks. *Clinical diagnosis*—endometritis; salpingitis; appendicitis; retroversion; cholelithiasis. *Pathological diagnosis*—periappendicitis; interstitial endometritis; hydrosalpinx; gall-stones. *Operation*—cholecystotomy; appendectomy; suspension; right salpingectomy. *Convalescence*—normal; in hospital twenty-seven days. *Postoperative history*—complete cure.

Gyn. No. 2394. January 21, 1908. Aged forty-five years. *Symptoms*—fulness after eating; tenderness after eating; jaundice. *Clinical diagnosis*—retroversion; chronic cholecystitis; R. V. O. *Pathological diagnosis*—catarrhal salpingitis; salpingo-oöphoritis. *Operation*—cholecystotomy; ventrosuspension; salpingo-oöphorectomy, right. *Convalescence*—poor drainage and fever; in hospital twenty-nine days. *Postoperative history* (see Case No. 2940). Returned for second operation.

Gyn. No. 2467. March 12, 1908. Aged forty-five years. *Symptoms*—indigestion; constipation; burning and frequency of urination; abdominal pain. *Clinical diagnosis*—dermoid cyst; cholelithiasis. *Pathological diagnosis*—teratoma of left ovary; bilateral peri-salpingitis; obliterative appendicitis and gall-stones. *Operation*—cholecystotomy; appendectomy; bilateral salpingo-oöphorectomy. *Convalescence*—normal; in hospital thirty-two days. *Postoperative history*—not traced.

Gyn. No. 2790. January 14, 1909. Aged thirty years. *Symptoms*—colic, five months; jaundice; vomiting; ventral hernia. *Clinical diagnosis*—cholelithiasis; umbilical hernia. *Pathological diagnosis*—gall-stones. *Operation*—cholecystostomy; herniotomy. *Convalescence*—conjunctivitis; in hospital thirty-four days. *Postoperative history*—complete cure.

Gyn. No. 2316. January 31, 1909. Aged thirty-nine years. *Symptoms*—dysmenorrhea; pain in right iliac region; slight on left side; indigestion; pain in epigastrium. *Clinical diagnosis*—R. V. O.; diastasis recti; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—plastic; appendectomy; cholecystotomy; Webster operation. *Convalescence*—persistent sinus; in hospital sixty-six days. *Postoperative history*—for two years after operation had almost constant hemorrhage from stomach with occasional jaundice; during past two years has regained health.

Gyn. No. 2853. March 4, 1909. Aged thirty-seven years. *Symptoms*—indigestion for five weeks; swelling in right side for

one month. *Clinical diagnosis*—uterine fibroid; pregnancy; cholelithiasis. *Pathological diagnosis*—fibromyoma; uteri; fetus; gall-stones. *Operation*—myomectomy; Cesarean section; cholecystostomy. *Convalescence*—wound abscess; in hospital thirty-eight days. *Postoperative history*—complete cure.

Gyn. No. 2864½. March 29, 1909. Aged forty-six years. *Symptoms*—pain in epigastrium and right hypochondrium, three months; jaundice; flatulence; bleeding from vagina. *Clinical diagnosis*—uterine fibroid; cholelithiasis. *Pathological diagnosis*—glandular endometritis; right tubo-ovarian cyst; left hydrosalpinx; gall-stones. *Operation*—hysterectomy; bilateral salpingo-oöphorectomy; cholecystostomy. *Convalescence*—pneumonia; in hospital twenty-nine days. *Postoperative history*—readmitted (see Case No. 3961).

Gyn. No. 2864¾. April 4, 1909. Aged thirty-six years. *Symptoms*—flatulence; abdominal distress; sleeplessness; indigestion. *Clinical diagnosis*—cholelithiasis; pelvic adhesions. *Pathological diagnosis*—left hydrosalpinx; perioöphoritis; normal appendix; gall-stones. *Operation*—cholecystostomy; left salpingo-oöphorectomy. *Convalescence*—normal; in hospital thirty-five days. *Postoperative history*—marked improvement; still complains of indigestion.

Gyn. No. 2886. April 6, 1909. Aged fifty-four years. *Symptoms*—uterine hemorrhage, five years; indigestion, ten years. *Clinical diagnosis*—uterine fibroid; cholelithiasis; hydrosalpinx. *Pathological diagnosis*—fibromyoma uteri; right parovarian cyst; chronic cholecystitis; normal ovaries; gall-stones. *Operation*—hysterectomy; bilateral salpingo-oöphorectomy; appendectomy; cholecystectomy. *Convalescence*—normal; in hospital twenty-eight days. *Postoperative history*—postoperative insanity for six months, followed by complete recovery.

Gyn. No. 3019. July 2, 1909. Aged fifty-five years. *Symptoms*—abdominal pain for fifteen months. *Clinical diagnosis*—cholelithias; R. V. O. *Pathological diagnosis*—gall-stones. *Operation*—plastic; cholecystostomy. *Convalescence*—normal; in hospital twenty-eight days. *Postoperative history*—patient well until July, 1911, when after a serious fall developed pain in abdomen; laparotomy performed and intestinal adhesions found; died postoperative pneumonia.

Gyn. No. 3104. November 7, 1909. Aged forty-nine years. *Symptoms*—pain in right ovarian region and right side; abdominal enlargement; menorrhagia; frequency of urination; constipated;

indigestion. *Clinical diagnosis*—uterine fibroid; chronic appendicitis; cholelithiasis; intestinal adhesions. *Pathological diagnosis*—fibromyoma uteri; periappendicitis; follicular cyst of left ovary. *Operation*—hysterectomy; appendectomy; bilateral salpingectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-four days. *Postoperative history*—cured except for constipation and hemorrhoids.

Gyn. No. 3121. November 22, 1909. *Symptoms*—irregular bleeding from vagina; indigestion; flatulence; intensely neurotic. *Clinical diagnosis*—carcinoma of fundus; cholelithiasis. *Pathological diagnosis*—adenocarcinoma corporis uteri; gall-stones. *Operation*—hysterectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-seven days. *Postoperative history*—relief of all symptoms; still neurotic.

Gyn. No. 3181. January 27, 1910. Aged thirty-four years. *Symptoms*—pain and tenderness in region of umbilicus and gall-bladder. *Clinical diagnosis*—umbilical hernia; diastasis recti; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystostomy; herniorrhaphy; Webster operation. *Convalescence*—normal; in hospital twenty-five days. *Postoperative history*—complete cure.

Gyn. No. 3186½. February 2, 1910. Aged forty-three years. *Symptoms*—dragging pain in pelvis; backache; colic, eighteen years; jaundice; vomiting. *Clinical diagnosis*—R. V. O.; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—plastic; cholecystostomy. *Convalescence*—normal; in hospital nineteen days. *Postoperative history*—not traced.

Gyn. No. 3194. February 8, 1910. Aged forty-one years. *Symptoms*—menorrhagia; leukorrhea; colic, many years; tenderness over gall-bladder. *Clinical diagnosis*—R. V. O.; lacerated cervix; chronic metritis; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—plastic; cholecystostomy. *Convalescence*—normal; in hospital twenty-three days. *Postoperative history*—complete cure.

Gyn. No. 3211. February 23, 1910. Aged forty-nine years. *Symptoms*—vomiting; jaundice; colic for six months; constipation; gastric irritability; menorrhagia; malodorous leukorrhea; clay-colored stools. *Clinical diagnosis*—fibroma uteri; cholelithiasis. *Pathological diagnosis*—fibroma uteri; left hydrosalpinx; chronic cholecystitis; gall-stones; right perisalpingitis; right perioöphoritis. *Operation*—hysterectomy; bilateral salpingo-oöphorectomy; cholecystectomy. *Convalescence*—normal; in hospital forty days. *Post-*

operative history—complete cure except one attack of pain in upper abdomen of short duration.

Gyn. No. 3252. March 24, 1910. Aged thirty-eight years. *Symptoms*—metrorrhagia; pain in umbilicus. *Clinical diagnosis*—lacerated cervix; cholelithiasis. *Pathological diagnosis*—concretion in appendix; gall-stones. *Operation*—plastic; appendectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-four days. *Postoperative history*—no improvement; operation in another hospital.

Gyn. No. 3331. May 28, 1910. Aged forty years. *Symptoms*—indigestion, two years; pain in right hypochondrium; epigastric pain after eating; vomiting. *Clinical diagnosis*—cholelithiasis; cecum mobile. *Pathological diagnosis*—normal appendix; gall-stones. *Operation*—cholecystostomy; appendectomy. *Convalescence*—normal; in hospital twenty-four days. *Postoperative history*—complete cure.

Gyn. No. 3349. June 12, 1910. Aged forty-two years. *Symptoms*—pain in right inguinal region; menorrhagia; constipation; vesical irritability; colic for years; vomiting. *Clinical diagnosis*—myoma uteri; cholelithiasis. *Pathological diagnosis*—adenomyoma uteri; fibromyoma uteri; right catarrhal salpingitis; left hydrosalpinx; periappendicitis. *Operation*—hysterectomy; appendectomy; cholecystostomy. *Convalescence*—hematoma in wound; pelvic cellulitis; vesical irritability; in hospital thirty-eight days. *Postoperative history*—marked improvement; suffers at times with hyperacidity.

Gyn. No. 3407. August 29, 1910. Aged thirty-two years. *Symptoms*—not given. *Clinical diagnosis*—appendicitis; gall-stones; right ovarian cyst. *Pathological diagnosis*—right cystic ovary; gall-stones. *Operation*—right oöphorectomy; appendectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-two days. *Postoperative history*—not traced.

Gyn. No. 3445. September 26, 1910. Aged twenty-eight years. *Symptoms*—"bilious attacks" many years; vomiting; colic, one year. *Clinical diagnosis*—chronic cholecystitis; chronic appendicitis. *Pathological diagnosis*—chronic appendicitis. *Operation*—cholecystostomy; appendectomy. *Convalescence*—normal; in hospital twenty-two days. *Postoperative history*—returned for second operation (see Case No. 3991).

Gyn. No. 3539. November 29, 1910. Aged forty-nine years. *Symptoms*—pain in back; leucorrhea, four months; pain in legs;

loss in weight; recurrent epigastric pain. *Clinical diagnosis*—fibroid of uterus; cholecystitis; cholelithiasis; retrocecal appendix; kink of sigmoid. *Pathological diagnosis*—fibromyoma uteri; periappendicitis; gall-stones. *Operation*—hysterectomy; appendectomy; bilateral salpingo-oöphorectomy; cholecystostomy. *Convalescence*—normal; in hospital thirty-six days. *Postoperative history*—complete cure.

Gyn. No. 3511. November 2, 1910. Aged fifty-four years. *Symptoms*—backache; pain in both legs; hunger pain in right hypochrondrium; flatulence. *Clinical diagnosis*—cholelithiasis. *Operation*—cholecystectomy; appendectomy. *Convalescence*—temperature $102\frac{2}{5}°$ F. seventh day. Thereafter normal; in hospital twenty-six days. *Postoperative history*—complete cure.

Gyn. No. 3666. March 19, 1911. Aged twenty-four years. *Symptoms*—appendiceal colic, three and one-half years; gall-bladder colic, one and one-half years; vomiting; constipation. *Clinical diagnosis*—appendicitis. *Pathological diagnosis*—normal appendix. *Operation*—appendectomy; cholecystostomy. *Convalescence*—discharge with drain in gall-bladder; normal convalescence; in hospital twenty-four days. *Postoperative history*—(see Case No. 3758). Returned for second operation.

Gyn. No. 3940. November 21, 1911. Aged forty-three years. *Symptoms*—dysmenorrhea, four years; colic, four years; vomiting; flatulence; constipation; jaundice. *Clinical diagnosis*—cholecystitis; pelvic inflammatory disease. *Pathological diagnosis*—fibromyoma uteri; bilateral pyosalpinx. *Operation*—hysterectomy; bilateral salpingo-oöphorectomy; cholecystotomy. *Convalescence*—normal; in hospital twenty-six days. *Postoperative history*—not traced.

Gyn. No. 3963. November 14, 1911. Aged forty-two years. *Symptoms*—dragging pain in lower abdomen; frequent urination; colic two years. *Clinical diagnosis*—R. V. O.; retroflexion; cholelithiasis. *Pathological diagnosis*—chronic cholecystitis; obliterative appendicitis. *Operation*—Plastic; suspension; appendectomy; cholecystectomy. *Convalescence*—normal; in hospital twenty-two days. *Postoperative history*—great improvement; complained of heaviness in stomach and heart-burn; limited diet.

Gyn. No. 3995. December 9, 1911. Aged thirty-five years. *Symptoms*—backache; headache; mass in vagina; dragging pain; colic once. *Clinical diagnosis*—R. V. O.; retroflexion; cholelithiasis. *Pathological diagnosis*—gall-stone. *Operation*—plastic; suspension;

cholecystostomy. *Convalescence*—normal; in hospital twenty-four days. *Postoperative history*—small hernia developed in gall-bladder scar with keloid formation, requiring repair; complete relief of original symptoms.

Gyn. No. 4007. December 20, 1911. Aged twenty-eight years. *Symptoms*—pain in left lower and upper abdomen; vomiting. *Clinical diagnosis*—cholelithiasis; left cystic ovary; diastasis recti. *Pathological diagnosis*—left catarrhal salpingitis; normal appendix; gall-stones. *Operation*—left salpingo-oöphorectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-six days. *Postoperative history*—much better since operation; some discomfort in epigastrium.

Gyn. No. 4023. January 5, 1912. Aged twenty-seven years. *Symptoms*—colic, one and one-half years; vomiting. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—obliterative appendicitis; gall-stones. *Operation*—cholecystenterostomy appendectomy. *Convalescence*—normal; in hospital nineteen days. *Postoperative history*—cured; occasional attack of backache.

Gyn. No. 4048. January 16, 1912. Aged thirty-seven years. *Symptoms*—leucorrhea; dysmenorrhea; severe headache; nausea; jaundice; gastric distress; frequency and urgency of urination. *Clinical diagnosis*—R. V. O.; lacerated cervix; cholelithiasis. *Pathological diagnosis*—erosion of cervix; gall-stone. *Operation*—plastic; ligation of ovarian veins; cholecystostomy. *Convalescence*—normal; in hospital twenty-one days. *Postoperative history*—complete cure except recurrence of headache.

Gyn. No. 4050. January 18, 1912. Aged forty-nine years. *Symptoms*—nervous indigestion, thirty years; colic; vomiting; jaundice; clay-colored stools; dark urine; prolapsus. *Clinical diagnosis*—R. V. O.; cholelithiasis. *Pathological diagnosis*—chronic cholecystitis; gall-stone. *Operation*—plastic; partial cholecystectomy; choledochotomy. *Convalescence*—diaphragmatic pleurisy; sinus on discharge; in hospital thirty-two days. *Postoperative history*—complete cure.

Gyn. No. 4071. February 5, 1912. Aged forty-five years. *Symptoms*—indigestion; flatulence; nausea; leucorrhea; pain lower abdomen. *Clinical diagnosis*—cholelithiasis; chronic appendicitis; retroflexion. *Pathological diagnosis*—chronic appendicitis. *Operation*—suspension; appendectomy; cholecystostomy. *Postoperative history*—complete cure.

Gyn. No. 4089. February 15, 1912. Aged fifty-two years.

Symptoms—frequency of urination; constipation; abdominal tumor; bleeding from vagina; colic for three years; jaundice. *Clinical diagnosis*—cholelithiasis; ovarian cysts; myoma uteri (carcinoma). *Pathological diagnosis*—adenocarcinoma left ovary; bilateral perisalpingitis; gall-stones. *Operation*—panhysterectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-one days. *Postoperative history*—complete cure.

Gyn. No. 4171. April 20, 1912. Aged fifty-one years. *Symptoms*—vomiting after meals, nine years; severe pain over gall-bladder, one year; loss of weight. *Clinical diagnosis*—cholelithiasis; chronic pancreatitis; ventral hernia. *Operation*—cholecystostomy; herniorrhaphy. *Convalescence*—continued vomiting; in hospital twenty-two days; gradual asthenia; died of cholemia.

Gyn. No. 4179. April 25, 1912. Aged forty-three years. *Symptoms*—headache; numbness in thighs; pain over coccyx; acute indigestion for years; flatulence. *Clinical diagnosis*—retroflexion; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—plastic; suspension; cholecystostomy. *Convalescence*—normal; in hospital twenty-two days. *Postoperative history*—complete relief except slight backache; no gall-bladder symptoms.

Gyn. No. 4217. May 14, 1912. Aged forty-two years. *Symptoms*—menorrhagia; frequency of urination; heart-burn; pain in right hypochondrium. *Clinical diagnosis*—myoma uteri; cholelithiasis. *Pathological diagnosis*—fibromyoma uteri; gall-stones. *Operation*—hysteromyomectomy; cholecystostomy. *Convalescence*—superficial wound infection; in hospital twenty-four days. *Postoperative history*—complete cure.

Gyn. No. 4218. May 17, 1912. Aged fifty-two years. *Symptoms*—pain in right hypochondrium, one year; frequency of urination. *Clinical diagnosis*—cholecystitis; intestinal adhesions. *Pathological diagnosis*—chronic cholecystitis; peri-appendicitis. *Operation*—appendectomy; cholecystectomy. *Convalescence*—normal; in hospital twenty-six days. *Postoperative history*—not improved; has continuous pain in gall-bladder region.

Gyn. No. 4232. May 27, 1912. Aged forty-three years. *Symptoms*—colic, twenty years; nausea; flatulence; pain in left lower abdomen. *Clinical diagnosis*—myoma uteri; chronic cholecystitis. *Pathological diagnosis*—fibromyoma uteri; left perisalpingo-oöphoritis; normal appendix. *Operation*—hysterectomy; left salpingo-oöphorectomy; appendectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-three days. *Postoperative history*—great

improvement; occasional attack of pain in gall-bladder region; constipation.

Gyn. No. 4241. June 6, 1912. Aged thirty-five years. *Symptoms*—pain in right lower abdomen; worse before period; colic for three years. *Clinical diagnosis*—chronic cholecystitis; bilateral hydrosalpinx. *Pathological diagnosis*—fibro-myoma uteri; bilateral hydrosalpinx; normal appendix. *Operation*—cholecystostomy; appendectomy; bilateral salpingectomy. *Convalescence*—normal; in hospital twenty-three days. *Postoperative history*—complete cure.

Gyn. No. 4243. June 7, 1912. *Symptoms*—empyema of gall-bladder following typhoid fever. *Clinical diagnosis*—empyema of gall-bladder; cholelithiasis; acute appendicitis. *Operation*—cholecystostomy; appendectomy. *Convalescence*—normal; in hospital twenty-three days. *Postoperative history*—slight improvement after operation; recurrence of pain in gall-bladder region. flatulence; nausea; vomiting; headache; constipation; second operation twenty months later; cystic duct was found completely occluded; gall-bladder was chronically inflamed and pyloric adhesions were present; cholecystectomy and adhesions released, March 18, 1914.

Gyn. No. 4264. July 3, 1912. Aged thirty-one years. *Symptoms*—pain in lower abdomen; headache; colic, seven years; vomiting; leucorrhea; fatigue. *Clinical diagnosis*—cholelithiasis; empyema of gall-bladder; retroflexion; R. V. O. *Pathological diagnosis*—chronic cholecystitis; obliterative appendicitis; gall-stones. *Operation*—plastic; suspension; appendectomy; cholecystectomy. *Convalescence*—normal; twenty-five days. *Postoperative history*—complete recovery so far as upper abdomen is concerned; still has menorrhagia.

Gyn. No. 4295. August 12, 1912. Aged twenty-eight years. *Symptoms*—pain in right hypochondrium; vomiting; colic, one year; chills. *Clinical diagnosis*—cholelithiasis; chronic cholecystitis; perineovaginal fistula. *Pathological diagnosis*—chronic cholecystitis; gall-stones; normal appendix. *Operation*—plastic; appendectomy; cholecystectomy. *Convalescence*—normal; in hospital seventeen days. *Postoperative history*—complete cure except for slight pain and fulness in epigastrium.

Gyn. No. 4306. August 19, 1912. Aged fifty-three years. *Symptoms*—general abdominal colic, six months; nausea and burning in epigastrium; jaundice; no local pain. *Clinical diagnosis*

—cholelithiasis; mucocele of appendix. *Pathological diagnosis*—chronic cholecystitis; gall-stones; mucocele of appendix. *Operation*—cholecystectomy; appendectomy. *Convalescence*—phlebitis and thrombosis of left femoral vein; in hospital forty days. *Postoperative history*—complete cure.

Gyn. No. 4310. August 20, 1912. Aged thirty-nine years. *Symptoms*—backache; frequency of urination; colic one and one-half years. *Clinical diagnosis*—R. V. O.; cystocele; cholelithiasis. *Operation*—plastic; appendectomy; cholecystostomy. *Convalescence*—superficial wound infection; small sinus on discharge; in hospital fifty-six days. *Postoperative history*—cured; has neurasthenic symptoms.

Gyn. No. 4372. October 4, 1912. Aged twenty-seven years. *Symptoms*—indigestion, eight years; diarrhea; colic, six months; vomiting. *Clinical diagnosis*—cholelithiasis. *Pathological diagnosis*—obliterative appendicitis; gall-stones. *Operation*—cholecystotomy; appendectomy. *Convalescence*—normal; in hospital fifteen days. *Postoperative history*—complete cure.

Gyn. No. 4412. October 24, 1912. Aged thirty-eight years. *Symptoms*—colic, six years; dragging pain in back. *Clinical diagnosis*—R. V. O.; retroflexion; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystostomy; plastic; suspension. *Convalescence*—normal; in hospital twenty-one days; *Postoperative history*—not traced.

Gyn. No. 4416. October 27, 1912. Aged forty-three years. *Symptoms*—procidentia uteri; dragging pain; constant pain in lower abdomen; occasional epigastric distress after meals. *Clinical diagnosis*—R. V. O.; chronic appendicitis; retroversion; cholelithiasis. *Pathological diagnosis*—chronic appendicitis; gall-stones. *Operation*—cholecystotomy; plastic; suspension; appendectomy. *Convalescence*—slight fever; in hospital nineteen days. *Postoperative history*—recurrence of prolapsus; suffers greatly with indigestion.

Gyn. No. 4460. November 18, 1912. Aged fifty-four years. *Symptoms*—indigestion for eight years; left-sided pain; colic for five weeks. *Clinical diagnosis*—myoma uteri; right salpingo-oöphoritis; cholelithiasis. *Pathological diagnosis*—fibromyoma uteri; right tubo-ovarian cyst; gall-stones. *Operation*—hysterectomy; conservation of left ovary; cholecystostomy. *Convalescence*—one attack of colic on twentieth day; in hospital twenty-four days. *Postoperative history*—complete cure; has slight menopausal symptoms.

Gyn. No. 4538. January 12, 1913. *Symptoms*—upper abdominal distress for two years. *Clinical diagnosis*—R. V. O.; retroflexion; cholelithiasis. *Pathological diagnosis*—gall-stone. *Operation*—cholecystostomy; plastic; suspension. *Convalescence*—normal; in hospital twenty-one days. *Postoperative history*—slight improvement; recurrence of colicky pains.

Gyn. No. 4559. January 5, 1913. Aged twenty-two years. *Symptoms*—menorrhagia; lower abdominal soreness; obstinate constipation; "weak stomach;" colic once. *Clinical diagnosis*—retroflexion; cirrhotic ovaries; cholelithiasis. *Pathological diagnosis*—chronic cholecystitis; gall-stones. *Operation*—suspension; cauterization of ovaries; cholecystectomy. *Convalescence*—superficial wound infection; in hospital twenty-nine days. *Postoperative history*—returned March 13, 1913, complaining of profuse vaginal discharge and persistent gastric irritability; exceedingly hysterical; no operation.

Gyn. No. 4570. January 31, 1913. Aged twenty-eight years. *Symptoms*—pain after eating, three years; severe colic with jaundice, six months ago. *Clinical diagnosis*—cholecystitis. *Operation*—cholecystotomy; plastic. *Convalescence*—septic temperature; abscess evacuated through wound on twenty-seventh day; death thirty-first day.

Gyn. No. 4581. February 11, 1913. Aged fifty years. *Symptoms*—irregular, profuse menstruation; indigestion; flatulence; epigastric pain. *Clinical diagnosis*—multiple fibroids; cholelithiasis; adherent appendix. *Pathological diagnosis*—myoma uteri; bilateral pyosalpinx; peri-appendicitis; cholecystitis; gall-stones. *Operation*—hysterectomy; bilateral salpingo-oöphorectomy; appendectomy; cholecystectomy. *Convalescence*—wound infection; sinus on discharge; in hospital thirty-eight days. *Postoperative history*—great improvement; flatulence; pain over incision; symptoms of menopause.

Gyn. No. 4582. January 11, 1913. Aged forty years. *Symptoms*—flatulence and nausea, one year; soreness in epigastrium. *Clinical diagnosis*—cholelithiasis; floating kidney. *Pathological diagnosis*—gall-stones. *Operation*—cholecystostomy; nephropexy. *Convalescence*—normal; in hospital twenty-eight days. *Postoperative history*—general improvement excellent; slight indigestion.

Gyn. No. 4655. April 5, 1913. Aged thirty-nine years. *Symptoms*—dull pain in right lower abdomen; poor appetite; indigestion. *Clinical diagnosis*—subacute appendicitis; chronic metritis; chole-

lithiasis. *Pathological diagnosis*—myometritis; obliterative appendicitis; chronic cholecystitis. *Operation*—hysterectomy; bilateral salpingectomy; appendectomy; cholecystectomy. *Convalescence*—peritonitis; death fourteenth day.

Gyn. No. 4696. April 30, 1913. Aged thirty-six years. *Symptoms*—pain in lower abdomen and epigastrium; nausea. *Clinical diagnosis*—R. V. O.; retroflexion; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—plastic; suspension; cholecystostomy. *Convalescence*—normal; in hospital twenty-six days. *Postoperative history*—complete relief of pain in epigastrium; complains of constipation.

Gyn. No. 4808. July 13, 1913. Aged forty years. *Symptoms*—colic, five months; constipation; heartburn; loss in weight. *Clinical diagnosis*—cholelithiasis; adherent appendix. *Pathological diagnosis*—chronic appendicitis; gall-stones. *Operation*—cholecystostomy; appendectomy. *Convalescence*—old tubercular process in lung became active; sinus on discharge; in hospital twenty-four days. *Postoperative history*—complete cure.

COMBINED OPERATIONS WITHOUT GALL-BLADDER SYMPTOMS.

Gyn. No. 917. May 21, 1903. Aged sixty years. *Symptoms*—dysuria; weakness and malnutrition. *Clinical diagnosis*—twisted ovarian cyst; cholelithiasis. *Pathological diagnosis*—bilateral papillomatous cysts of ovaries. *Operation*—cholelithotomy; hysterosalpingo-oöphorectomy. *Convalescence*—normal; in hospital forty-nine days. *Postoperative history*—well for several years; died ten years after operation; cause unknown.

Gyn. 1055. October 17, 1903. Aged thirty-five years. *Symptoms*—pain in right iliac region; backache; constipation. *Clinical diagnosis*—retroversion; adherent appendix; cholelithiasis; right parovarian cyst. *Pathological diagnosis*—parovarian cyst; gall-stones. *Operation*—appendectomy; cholelithotomy; right cystectomy; suspension. *Convalescence*—normal; in hospital twenty-eight days. *Postoperative history*—two years later had gall-bladder pain for one year; now complete cure.

Gyn. No 1061. October 21, 1903. Aged forty-three years. *Symptoms*—abdominal heaviness and enlargement. *Clinical diagnosis*—fibroid of uterus; cholelithiasis. *Pathological diagnosis*—fibro-myoma uteri; atrophic endometritis; *Operation*—cholelithotomy; supravaginal hysterectomy; right ovary conserved.

Convalescence—suppuration of cervical stump; in hospital forty-eight days. *Postoperative history*—complete cure; except for slight pain in gall-bladder incision.

Gyn. No. 1071. November 9, 1903. Aged forty-five years. *Symptoms*—abdominal cyst. *Clinical diagnosis*—right multilocular ovasian cyst; cholelithiasis; intestinal adhesions. *Pathological diagnosis*—cystadenoma ovarii; pseudomucinosum glandulare. *Operation*—cholelithotomy; ventrofixation; salpingo-oöphorectomy. *Convalescence*—urinary retention; cystitis; in hospital twenty-eight days. *Postoperative history*—not traced.

Gyn. No. 1181. March 9, 1904. Aged fifty years. *Symptoms*—metrorrhagia; menorrhagia; backache; incontinence of urine. *Clinical diagnosis*—uterine fibroid; cholelithiasis. *Pathological diagnosis*—fibromyoma uteri; atrophic endometritis; gall-stones. *Operation*—hysterectomy; cholelithotomy. *Convalescence*—pain in chest with slight fever; in hospital thirty-one days. *Postoperative history*—complete cure with exception of occasional headache.

Gyn. No. 1840. June 5, 1906. Aged forty-eight years. *Symptoms*—menorrhagia; pain in lower abdomen referred down right leg. *Clinical diagnosis*—sloughing submucous fibriod; cholelithiasis. *Pathological diagnosis*—myoma uteri; chronic oöphoritis; gall-stones. *Operation*—panhysterectomy; cholelithotomy. *Convalescence*—normal; in hospital thirty-seven days. *Postoperative history*—not traced.

Gyn. No. 1963. October 18, 1906. Aged thirty-six years. *Symptoms*—pain in back, shooting down thighs; cold feet; tingling; frequency of urination; menorrhagia. *Clinical diagnosis*—uterine fibroid; cholelithiasis. *Pathological diagnosis*—fibromyoma uteri; gall-stones. *Operation*—hysterectomy; conservation of right ovary; cholelithotomy. *Convalescence*—superficial wound infection; in hospital twenty-five days. *Postoperative history*—complete cure.

Gyn. No. 2029. January 3, 1907. Aged fifty-one years. *Symptoms*.—prolapsus. *Clinical diagnosis*—complete prolapsus; R. V. O. *Pathological diagnosis*—hypertrophied cervix. *Operation*—cholecystotomy; plastic; fixation of uterus. *Convalescence*—normal; in hospital thirty-three days. *Postoperative history*—not traced.

Gyn. No. 2162. May 12, 1907. Aged thirty-five years. *Symptoms*—not given. *Clinical diagnosis*—retroflexion; R. V. O.; lacerated cervix. *Operation*—cholecystotomy; plastic; suspension. *Convalescence*—normal; in hospital twenty-two days. *Postoperative history*—not traced.

Gyn. No. 2670. October 6, 1908. Aged thirty-nine years. *Symptoms*—dysuria; frequency of urination. *Clinical diagnosis*—myoma uteri; cholelithiasis. *Pathological diagnosis*—fibromyoma uteri; glandular endometritis; follicular cyst left ovary, cholecystitis. *Operation*—hysterectomy; conservation right ovary; cholecystectomy. *Convalescence*—slight prolongation of vomiting; in hospital twenty-three days. *Postoperative history*—complete cure.

Gyn. No. 2447. February 28, 1908. Aged fifty-two years. *Symptoms*—hernia in left groin; backache; leucorrhea. *Clinical diagnosis*—R. V. O.; retroversion; femoral hernia; cholelithiasis. *Pathological diagnosis*—gall-stones. *Operation*—cholecystotomy; plastic; suspension; herniorrhaphy. *Convalescence*—normal; in hospital twenty-seven days. *Postoperative history*—complete recovery.

Gyn. No. 2757. December 5, 1908. Aged forty-one years. *Symptoms*—pain in rectum and on micturition; abdominal tumor. *Clinical diagnosis*—myoma uteri; cholelithiasis. *Pathological diagnosis*—fibromyoma uteri; gall-stones. *Operation*—hysterectomy; conservation right ovary; cholecystostomy. *Convalescence*—persistent abdominal pain, especially on right side; in hospital forty-five days. *Postoperative history*—not traced.

Gyn. No. 2988. June 21, 1909. Aged sixty-five years. *Symptoms*—bleeding from vagina, two months. *Clinical diagnosis*—myoma uteri; cholelithiasis. *Pathological diagnosis*—fibromyoma uteri; bilateral pyosalpinx; perioöphoritis; gall-stones. *Operation*—cholelithotomy; hysterectomy; bilateral salpingo-oöphorectomy. *Convalescence*—phlebitis of right leg; in hospital twenty-one days. *Postoperative history*—complete cure.

Gyn. No. 3046. September 14, 1909. Aged sixty years. *Symptoms*—swelling of abdomen and pain. *Clinical diagnosis*—multilocular ovarian cyst; cholelithiasis. *Pathological diagnosis*—cystadenoma ovarii pseudomucanosum glandulare; gall-stones. *Operation*—salpingo-oöphorectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-nine days. *Postoperative history*—complete physical recovery; five years later mind affected.

Gyn. No. 3587. January 11, 1911. Aged forty-eight years. *Symptoms*—menorrhagia; metrorrhagia. *Clinical diagnosis*—retroflexion; cholelithiasis. *Pathological diagnosis*—interstitial endometritis; gall-stones. *Operation*—hysterectomy; salpingo-oöphorectomy; appendectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-six days. *Postoperative history*—not traced.

Gyn. No. 3632. February 16, 1911. Aged forty-two years. *Symptoms*—not given. *Clinical diagnosis*—umbilical hernia; cholelithiasis; hemorrhoids. *Pathological diagnosis*—gall-stones. *Operation*—plastic; herniorrhaphy; cholecystostomy. *Convalescence*—normal; in hospital twenty-one days. *Postoperative history*—complete cure.

Gyn. No. 3707. April 19, 1911. Aged forty-three years. *Symptoms*—constipation. *Clinical diagnosis*—tuboövarian cyst; mucoid appendix; cholelithiasis. *Pathological diagnosis*—chronic metritis; bilateral pyosalpinx; catarrhal appendix; gall-stone. *Operation*—hysterectomy; bilateral salpingo-oöphorectomy; appendectomy; cholecystostomy. *Convalescence*—normal; in hospital nineteen days. *Postoperative history*—gastric condition excellent; slight pain in gall-bladder incision; needs light laxative; has menopausal symptoms.

Gyn. No. 3764. June 2, 1911. Aged twenty-six years. *Symptoms*—pain in lower abdomen and sacrum; headache; menorrhagia. *Clinical diagnosis*—R. V. O.; lacerated cervix; retroflexion; appendicitis; cholelithiasis. *Pathological diagnosis*—endometritis cervicis; peri-appendicitis; gall-stones. *Operation*—plastic; appendectomy; suspension; cholecystostomy. *Convalescence*—normal; in hospital twenty-two days. *Postoperative history*—not traced.

Gyn. No. 3771. June 11, 1911. Aged forty-nine years. *Symptoms*—menorrhagia. *Clinical diagnosis*—uterine fibroid; cholelithiasis. *Pathological diagnosis*—fibromyoma uteri; bilateral pyosalpinx; gall-stones. *Operation*—hysterectomy; bilateral salpingo-oöphorectomy; cholecystostomy. *Convalescence*—normal in hospital twenty-three days. *Postoperative history*—complete cure.

Gyn. No. 3811. July 22, 1911. Aged thirty-two years. *Symptoms*—pain lower abdomen; heaviness; several attacks of appendicitis. *Clinical diagnosis*—R. V. O.; retroversion; cholelithiasis; right cystic ovary; chronic appendicitis; hemorrhoids. *Pathological diagnosis*—chronic appendicitis; gall-stone. *Operation*—cholecystostomy; appendectomy; suspension; plastic; right oöphorectomy. *Convalescence*—normal; twenty-nine days. *Postoperative history*—no upper abdominal symptoms. Intense menorrhagia.

Gyn. No. 3837. August 15, 1911. Aged thirty years. *Symptoms*—sharp pain both sides of lower abdomen; leucorrhea. *Clinical diagnosis*—R. V. O.; retroflexion; cholelithiasis. *Pathological diagnosis*—chronic cholelithiasis; gall-stones. *Operation*—chole-

cystectomy; plastic; suspension. *Convalescence*—normal; in hospital twenty-five days. *Postoperative history*—no improvement; worse than before operation.

Gyn. No. 3983. December 2, 1911. Aged forty-four years. *Symptoms*—backache; headache; dragging pain in pelvis; menorrhagia. *Clinical diagnosis*—chronic metritis; cholelithiasis. *Pathological diagnosis*—adenomyoma uteri; bilateral catarrhal salpingitis; normal appendix; gall-stones. *Operation*—hysterectomy; bilateral salpingectomy; appendectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-two days. *Postoperative history*—no upper abdominal symptoms; patient is nervous and complains of pain in left side and rectum.

Gyn. No. 4037. January 10, 1912. Aged thirty-four years. *Symptoms*—dull pain in right lower abdomen with swelling; menorrhagia; constipation. *Clinical diagnosis*—uterine fibroid; cholecystitis; cholelithiasis. *Pathological diagnosis*—fibromyoma uteri; bilateral perisalpingitis; gall-stones. *Operation*—hysteromectomy; bilateral salpingectomy; cholecystostomy. *Convalescecen*—normal; in hospital twenty-one days. *Postoperative history*—complete cure.

Gyn. No. 4043. January 13, 1912. Aged thirty-three years. *Symptoms*—pain in lower right abdomen, one year; acute pain daily in this region. *Clinical diagnosis*—R. V. O.; chronic appendicitis; cholecystitis. *Pathological diagnosis*—normal appendix. *Operation*—plastic; appendectomy; cholecystostomy. *Convalescence*—normal; in hospital nineteen days. *Postoperative history*—worse than before operation; periodic vomiting; since 1912 has lost her voice; hysteric manifestations.

Gyn. 4110. March 5, 1912. Aged sixty-two years. *Symptoms*—bloody vaginal discharge. *Clinical diagnosis*—myoma uteri; cholelithiasis. *Pathological diagnosis*—adenocarcinoma of fundus; fibro-myoma uteri; gall-stones. *Operation*—hysterectomy; cholecystostomy. *Convalescence*—normal; in hospital thirty-nine days. *Postoperative history*—cured except for sacral backache.

Gyn. No. 4139. March 28, 1912. Aged twenty-six years. *Symptoms*—pain in right iliac fossa; constipation. *Clinical diagnosis*—Lane's kink of ileum; cholelithiasis. *Pathological diagnosis*—obliterative appendicitis; gall-stone. *Operation*—appendectomy; liberation of Lane's kink; cholecystotomy. *Convalescence*—normal; in hospital eighteen days. *Postoperative history*—for six months had intense hyperacidity; no pain in right side; constipation not relieved.

Gyn. No. 4153. April 8, 1912. Aged thirty-five years. *Symptoms*—"abdominal looseness;" weakness in legs; menorrhagia; frequent urination. *Clinical diagnosis*—uterine fibroid; cholelithiasis. *Pathological diagnosis*—fibro-myoma uteri; right hydrohematosalpinx; left hydrosalpinx; obliterative appendicitis; gall-stones. *Operation*—hysterectomy; bilateral salpingo-oöphorectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-eight days. *Postoperative history*—great improvement; pressure symptoms in region of rectum.

Gyn. No. 4207. May 11, 1912. Aged forty-seven years. *Symptoms*—abdominal enlargement; fatigue; abdominal cramps; prolapsus. *Clinical diagnosis*—R. V. O.; uterine fibroid; cholelithiasis. *Pathological diagnosis*—fibro-myoma; gall-stones. *Operation*—plastic; hysterectomy; bilateral salpingo-oöphorectomy; cholecystostomy. *Convalescence*—normal; in hospital twenty-three days. *Postoperative history*—general health markedly improved; complains of surgical menopause.

Gyn. No. 4578. February 5, 1913. Aged forty-three years. *Symptzms*—menorrhagia and metrorrhagia. *Clinical diagnosis*—myoma uteri; chronic appendicitis; cholelithiasis. *Pathological diagnosis*—fibro-myoma uteri; tuberculosis of uterus and both tubes; peri-appendicitis; gall-stones. *Operation*—plastic; hysterectomy; cholecystostomy; appendectomy. *Convalescence*—prolonged postoperative vomiting; in hospital forty-three days. *Postoperative history*—complete cure.

Gyn. No. 4588¾. February 13, 1913. Aged forty-four years. *Symptoms*—vesical irritability and cystocele; menorrhagia; stinging pain in left lower abdomen. *Clinical diagnosis*—R. V. O.; myoma uteri; cholelithiasis. *Pathological diagnosis*—fibromyoma uteri gall-stone. *Operation*—plastic; hysterectomy; cholelithotomy. *Convalescence*—hematoma and superficial infection of gall-bladder wound; in hospital twenty-five days. *Postoperative history*—marked improvement; complains of recurring pain in gall-bladder region; states she was never so well in her life.

DISCUSSION

Dr. Reuben Peterson.—In reality no one has a right to open the discussion on such a paper as Dr. Clark's unless he has made a similar analysis of his own cases, which would mean that he had devoted a great deal of time to this subject. When I read the announcement that Dr. Clark was to read a paper on this subject I thought I would look up my own cases, but I soon found that this could not be done satisfactorily in time for the meeting, so I must make my report later.

I have been palpating the gall-bladder as a routine procedure for the last ten or twelve years when the abdomen was opened for other purposees. Although I am looking up all my laparotomy cases, both public and private, most of them have been in the University Hospital, where there is a sharply divided line between surgical and gynecological patients. In other words, when a patient gave a history of gall-stone attacks she was assigned to the surgical service even if she had pelvic symptoms in addition.

Roughly speaking, I find in about 1000 abdominal sections for pelvic lesions gall-stones were present in 10 to 14 per cent. of the cases. Reviewing the histories after the gall-stones were found, it was not uncommon to find that gall-stone symptoms had been overlooked by the admitting physician or the historian. In other words more exact knowledge of what constitutes a gall-stone history or more care in taking the history might have more frequently aroused suspicion as to the presence of gall-stones.

My cases may prove interesting from one stand-point, since I have drained the gall-bladder in every instance where stones were removed. At least if I am successful in ascertaining the after histories of these patients it will show the value of this operation in nearly a hundred cases.

I have had quite a number of cases where I did not think it advisable to remove the gall-stones at the same operation during which they were discovered, because of the condition of the patient or for some other reason.

It seems to me as if gall-stones were especially common where there is cancer of the uterus, but this may not be found true when my series is analyzed.

I have always refrained from palpating the gall-bladder in the presence of inflammatory disease of the pelvis.

Unless one is accustomed to palpating the contents of the abdomen, or if the gall-bladder be palpated carelessly, especially in case the bladder be distended with bile, gall-stones may easily be overlooked.

I think Dr. Clark is to be complimented for this splendid paper which represents much time and labor.

Dr. Philander A. Harris.—When operating for gynecological troubles, in which the patients presented a history of gall-stone disease, I have generally, at the same time, operated for the cure of the disease in the gall-bladder. It has only now and then happened, with the hand introduced through the abdominal incision, that I have discovered stones in the gall-bladder which were not indicated by the patient's history as taken before operation.

I am rather surprised to hear that Dr. Peterson has found gall-stones present in 12 per cent. of the patients he has palpated through the abdominal incision. Such a percentage or proportion seems very large to me, for I feel quite sure that I have not palpated stones in the gall-bladder in as much as 5 per cent. of all the cases thus tested. In making these tests it has been my custom to exert gentle but persistent pressure upon the gall-bladder until most of the bile was driven out of it into the common duct. Under such gentle but continued pressure the gall-bladder generally empties, and if thus carefully examined, very few cases of cholelithiasis will escape detection.

I have removed the gall-bladder in at least 70 per cent. of all the cases upon which I have operated for gall-stone disease. I have repeatedly effected cures by removing the gall-bladder from patients who had not been cured by the operation of cholecystotomy. In some of these cases I found a stone or stones in the gall-bladder which had undoubtedly been overlooked by the surgeon who had previously performed cholecystotomy.

In exsecting the gall-bladder the operation should be thorough. An operation which leaves in the body any part of the corpus is not an exsection of the gall-bladder: it is an amputation of the cysticus. In making the dissection the corpus should be followed until the cystic neck is exposed, at which point it should be severed.

Dr. Harris.—I have removed the gall-bladder in at least 70 per cent. of the cases on which I have operated, something less than 200, and I have operated repeatedly once or twice in many cases and on those in which I refused at first to operate upon. I have operated repeatedly for failure to cure where gall-stones have been removed and leaving the gall-bladder in place. My experience teaches me that the thorough removal of the gall-bladder is good practice, and I know now that quite a number of operators are advocating the removal of the gall-bladder, being careful to take it down close to the common duct and remove it all

Dr. John G. Clark (closing): There are several points which have been brought up in the discussion which are covered in the paper, but were not dwelt upon because of limited time.

The point noted by Dr. Peterson with reference to a history of cholecystitis or gall-stones is interesting. It is characteristic oftentimes of the average resident physician, be he ever so well trained, that when a case is admitted to a gynecological service, he thinks he must prepare a special history bearing particularly upon the diseases of women, and may therefore overlook the most obvious symptoms in other localities. For this reason in our history blanks there are special headings to attract his attention to any subsidiary or outlying condition. This furnishes a clean-cut history of variations in all abdominal organs. Ten years ago, when reviewing our histories of cholecystitis, they were often absolutely vague upon many important points, but now we require a thorough history, pertaining first to the subject which is under consideration and then to correlated factors.

The question has been brought up as to contra-indications to the removal of gall-stones when the operation has been performed for some other condition. This point has been elaborated in my paper.

If you ask me in what proportion of pelvic inflammatory cases do gall-stones occur, I cannot answer, for I make no exploration of the upper abdomen in these cases. Six or seven cases in our series classified under inflammatory lesions are represented by hydrosalpinx or adherent ovaries and tubes in which the acute process has long since subsided. In the presence of a simple hydrosalpinx or chronic adhesions of ovaries and tubes we do not disturb these conditions if there are symp-

toms of trouble in the upper abdomen until a manual exploration is made. In our series there were only 7 out of a total of 107 cases noted in association with pelvic inflammatory conditions, and in no instance was there pus. A second contra-indication is when one is in the midst of a desperate operation as in extra-uterine pregnancy, with extravastated blood in the peritoneal cavity, or in any other emergency operation. A query may be raised as to the case of inoperable carcinoma of the stomach in which gall-stones were removed. This case requires an explanatory note. Although the carcinoma was inoperable, the patient was suffering in addition extreme pain from gall-stone attacks. We at least obtained relief of these symptoms from the removal of the gall-stones, and therefore made our patient more comfortable.

My summary of cases does not give sufficient data to answer the question as to what proportion of major abdominal operations yield coincident cholelithiasis. I cannot answer that question because I am unable to give offhand the number of abdominal sections that were performed during the period in which these cases have occurred.

THE BEHAVIOR OF THE ABDOMINAL CUTANEOUS REFLEXES IN ACUTE CONDITIONS WITHIN THE ABDOMEN AND PELVIS

By Richard R. Smith, M.D.
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In the clinical study of acute processes within the abdomen, American surgeons have apparently paid but little attention to the abdominal cutaneous reflexes. The subject would seem to be worthy of study, since these reflexes are affected constantly enough when certain local conditions exist to make them, I believe, of some little aid to us.

The abdominal cutaneous reflex and its deportment in certain diseases of the nervous system is, of course, an every-day matter with neurologists, the test having a definite place in the diagnosis of certain nervous disorders. Without going into detail they find (quoted largely from Müller and Seidelmann) that the reflexes fail or are markedly diminished on the affected side of the body in spinal and cerebral hemaplegias of various origin, and that this symptom persists even after the disappearance of the motor symptoms. They fail on both sides in multiple sclerosis and this is an early symptom of great value. They are usually exaggerated in early cases of tabes, failing in late cases or those in which there is anesthesia of the skin of the abdomen. The reflexes are retained in patients with spastic paralysis until a late stage is reached, and is a point of

differential diagnosis between this disease and multiple sclerosis. In all nervous diseases in which there is increased abdominal tension they are diminished or lacking. Hysteria does not abolish them even when anesthesia of the skin of the abdomen exists. They have been used also in the localization of spinal injuries.

Little literature exists, however, regarding this reflex in connection with local conditions within the abdomen, though European internists have interested themselves in the matter to some considerable extent. References to all publications that I could find have been placed in the bibliography, and some of them are here briefly reviewed.

Rosenbach (according to Rolleston) in 1876 was the first to call attention to the importance of this reflex in clinical medicine, and it has been frequently alluded to as "Rosenbach's sign."

Bodon (in 1898) called attention to it in inflammatory conditions within the pelvis. He found, as a rule, that pelvic cellulitis does not affect the reflex, while with pelvic peritonitis it was lost or diminished on the diseased side. He thought the primary nature and source of the inflammatory trouble might in some cases be thus distinguished or at least the diagnosis strengthened. His opinions were based upon a study of nearly 300 women.

Probably the first published studies of this reflex in acute abdominal diseases was by Jamin in 1904. He particularly emphasized the loss or impairment of the reflex on the right side of the abdomen in "perityphlitis," and states that the test is here of particular value because we are dealing mostly with healthy young individuals with active reflexes. He noted also a disturbance of the reflex in gall-stone colic, cholecystitis, and "acute swelling of the liver."

Rolleston in 45 cases of undoubted typhoid fever found the reflex diminished or lost in 42. Of these the reflex

was completely lost in 31 and impaired to a greater or less degree in 11.

Sicard in 26 cases of typhoid fever in older children also found a marked diminution or absence of the abdominal reflex in 22. In two the involvement was transitory and in two the reflexes were not affected at all. He concludes that the abdominal cutaneous reflexes are affected at some time in the course of practically every case of typhoid fever, the most frequent point of involvement being the right lower quadrant.

Müller and Seidelmann, in a very comprehensive article on the abdominal cutaneous reflexes (one that is well worth reading), comment upon its behavior in acute surgical conditions within the abdomen. They say that one may regard it as a fundamental law that all diffuse or local diseased processes which take place within the abdomen and which cause a limited or general increase of tension of the abdominal musculature either weaken or prevent all or some of the abdominal cutaneous reflexes for the time that such increase of tension lasts. In distentions of the abdomen which take place slowly through chronic disease and are but little painful they are usually not disturbed; for example, those due to circulatory disturbance, cancer, or chronic tuberculosis. The same holds true with small ovarian tumors and in pregnancy that is not too far advanced. In edema of the abdominal walls caused by heart or kidney affections, and in intense, lasting overdistention, they are sometimes weakened, though by no means always so. After evacuation by puncture of a large amount of ascites, and the consequent relaxation of the walls, the reflexes previously present may sometimes temporarily disappear. In affections in which the distention takes place more rapidly the abdomen is painful and rigidity is present, the reflexes are commonly lost, as with acute peritonitis or painful meteorism, and frequently in typhoid fever. A one-sided and, therefore,

significant disappearance of the cutaneous reflex is seen very commonly in acute inflammatory local infections as cause rigidity with circumscribed tenderness over the affected, organ. They believe that under such circumstances the loss of the reflex is always acompanied by rigidity and that the increased muscle tension simply covers or abolishes temporarily the normal response. They agree with Jarmin that the testing of the abdominal cutaneous reflex in the diagnosis of appendicitis has a certain value. They lay much emphasis on the technique employed in order to obtain reliable results.

The statements made in regard to the abdominal cutaneous reflexes have been in the main true. There has been, however, to my knowledge no series of observations published from which we might make a closer study of the question and it was with the idea of doing this that I began two years ago to note the response of the reflexes in some of our abdominal cases. Since that time, besides a considerable number of informal observations, I have recorded in 175 cases (mostly of acute diseases) the reflexes before operation, and the condition met with at operation which followed soon after.

The abdominal cutaneous reflex may be obtained in practically all healthy individuals of both sexes, with certain exceptions that must constantly be borne in mind. It is uncertain (it is said) in children under three years of age, but is very active during childhood and adult life. As life advances it gradually becomes weaker or is lost though exceptions even in individuals over sixty are plentiful. In those with obese abdominal walls it is common to see it weak or absent, and the same is true of those whose walls for any reason are relaxed, the most frequent one being child bearing. Negative or weak responses in such individuals as constitute these exceptions, unless the difference in a certain section or sections is very clear, therefore means

but little. Positive findings, however, have their usual value. I think this is a point to be specially emphasized.

A word as to the physiology: the centripetal impulses pass through the posterior horn of the eighth to the twelfth dorsal nerves, thence along the posterior columns to the superior pyramidal decussation and through the middle lemniscus to the motor cortex of the opposite side, thence centrifugally along the pyramidal tracts to the cells in the anterior horn of the last four dorsal segments. This arrangement common to the skin reflexes explains the behavior of the reflex in lesions affecting the higher centres. The reflex is apparently one of the body defences, its object being to protect the abdominal organs against injury by instantly making rigid the walls when threatened from the outside.

The testing of the reflexes is very simple, takes but a moment, and needs no apparatus—points of practical importance. Care is, however, necessary in order to obtain reliable results—a fact emphasized by various writers. The abdomen may be divided into quadrants—an upper and lower one on either side. Neurologists have sometimes made a division of six, three on either side, but four would seem more practical in testing for local conditions. I employ any kind of a blunt instrument, usually the blunt end of a pencil. If this fails I sometimes use a pin drawn lightly over the skin. The stroke should be full, rather light, and not too swift. It is applied in an oblique direction, parallel with the line of the groin and the edge of the ribs. The first stroke is apt to give the strongest response; after that it usually weakens or is entirely lost, a point of importance when the reflexes are weak. One must be careful not to encroach upon territory supplied by another reflex. If the reflex is present an almost simultaneous contraction of the oblique muscle or rectus (or both) takes place, which when well marked will pull the umbilicus to the side that is being tested. When weak a fleeting and slight depression

of the wall only is produced. One must see that the muscles are not wilfully put on tension, as it may weaken or destroy the response. Again, if the stroke causes pain a voluntary contraction is apt to take place on that side of the abdomen or body, which, however, distinctly follows the stroke and will not deceive one if he is on his guard. Movements of the fat must not be confused with muscle contraction, an easy source of error in some cases.

As stated above the reflex is a very constant one in healthy young individuals, fully as much so as the tendon reflexes. Müller and Seidelmann, examining 1000 healthy young soldiers, found the cutaneous reflexes always present with but one exception. They were all stripped and examined in the standing position and were stroked with the blunt end of a pencil (rarely the point of the pencil was necessary). They found no great difference between the right and the left side under the same technique. The same obtained in 2000 healthy young women with normal abdominal walls and apparently intact abdominal organs, examined in the ambulatorium of their clinic. Even with fat or relaxed walls (for instance, after repeated child-bearing) the reflexes seldom failed, although often weakened and hard to obtain. It is well to bear in mind that they tested their subjects in a standing position. It is obviously impossible to test patients suffering from any of the diseases under discussion in this way. I have sometimes found in young healthy individuals the reflex weak or lacking in this or that quadrant without assignable cause—this is, however, exceptional.

The largest group in which we have made this test has naturally been that of appendicitis cases. We made note of the reflexes in 86 patients with this disease, 11 of which were chronic. In the 11 chronic cases here noted there was some involvement of the reflexes in 5; 3 were women who had borne children; 1 was a man with very obese abdominal walls who had entirely negative reflexes; and in 1 case (a woman), there was a negative reflex in the right lower

quadrant, for reasons unknown. Except in the last instances, then, these reflexes acted within their ordinary limitations. This does not represent the total number of cases operated during the same period, but I have found the reflex so little affected in our chronic cases that we made no further record of it.

There were 75 cases of acute appendicitis, with involvement of the reflex in 65; in 10 the reflexes were not involved. The latter are instructive—3 of them were boys. with rigidity and a well-marked acute appendicitis. In children these reflexes are ordinarily very active and we have learned to be cautious in not placing too much stress upon the fact that in any given case they were all present without distinct difference in the response in the various quadrants. It is not improbable that in these cases there was a comparative diminution. One of these boys at least left the hospital with exceedingly active reflexes, although they were but mildly present at the time of operation. In this group of exceptions were 6 men, with a well-marked appendicitis, (4 with rigidity and 2 in which this latter symptom was not recorded). They all had active reflexes without the distinct differences to which alone we may attach importance under such circumstances, and must be regarded as exceptions.

In the other 65 acute cases (56 under forty years of age), the reflexes were more or less involved. In 53 of them rigidity was recorded as also present. In 7 the state of tension was not recorded, but we may assume that in part of these at least it was present. In 5 the reflexes were involved, although there was no rigidity. The relationship of diminished or lost reflexes to rigidity is interesting. The two are so often present at the same time as to give rise to the opinion expressed by Müller and Seidelmann that physiologically the reflex is simply covered by the constant muscular tension present. Closer investigation, however, does not always bear this out. We find that, although rigidity may be almost universally present over the abdomen,

the involvement of the reflex is frequently limited to the area over the lesion—also with no rigidity that involved reflexes are not very uncommon.

The involvement consisted in a loss or occasionally a marked diminution, as compared with the others, of the reflex of the right lower quadrant. Very frequently the involvement to some or even all of the others.

The extent to which the reflex is involved is significant. An involvement of the reflex of the right lower quadrant has almost always denoted a fairly well localized inflammatory process. With further involvement (that is, an absence of the reflex of the upper right or lower left quadrant) the inflammation may yet be fairly well circumscribed. But when all are involved we have almost invariably found a considerable extension from the original seat of trouble. In all severe extensions of the inflammatory process (those that have been commonly designated as "general peritonitis") all the reflexes have invariably been gone. When other symptoms of appendicitis have been definite and we have found little involvement of the reflex, we have occasionally found the reason for the same on opening the abdomen—in such there has been slight or no involvement of the peritoneum. The appendicitis has been very mild or the appendix has been found to the outer side and underneath the cecum, or well down in the pelvis. The prognosis in any given case of appendicitis is affected principally by the pulse, condition of the circulation and the local condition present—among the latter the extent of the involvement of the reflexes is also important and may with limitations be depended upon.

We have noted the reflex in 6 acute gall-bladder cases. In these there were no stones present, but there was a more or less active state of inflammation. In 5 of the 6 rigidity was present and the reflex of the right upper quadrant was involved. In the chronic cases, with or without stones (of which we have, however, but formally noted 5), we found

no involvement that could not be accounted for by age or by flaccid or obese walls. In a number of cases of acute cholecystitis (unoperated) we commonly found the upper right quadrant involved, although no record has been made of these, since they were not verified by operation.

We noted the reflexes in 10 cases of pelvic inflammatory disease that were more or less acute in character and with pus present in all. None of these, of course, were perfectly fresh cases in the sense that we speak of acute appendicitis, but were cases that were not subsiding satisfactorily and could not be called chronic. In one other case there was a subacute exacerbation of an old chronic condition, in which pus was found, that had positive reflexes. (In our more chronic cases, in which record was not always kept, there were none in which the reflexes were absent). The involvement in these pelvic cases was quite uniformly in the lower quadrant on both sides. In women who have not borne children the disappearance of the reflex would have significance, but it could not be used to distinguish a pelvic inflammation from an appendicitis. The group is too small to warrant further conclusions.

Our group of ectopic cases (13 in number) is too small for any very definite conclusion; 5 of these women had borne children, and for this reason little stress could be placed upon the involved reflexes. In one with rigid and distended abdomen the reflexes were also mildly present and in all the rest the reflexes were normal. I am under the impression from this meager observation that an effusion of blood into the pelvis and lower abdomen seldom affects the reflexes, or is less liable to do so than an inflammatory process.

We have had 4 cases of perforated gastric or duodenal ulcer (all men), with marked abdominal rigidity and in which the reflexes were totally lost, except in 1 case they were very slightly present in the lower quadrant when seen three hours after the perforation. Seven hours later the absence of the reflexes was general.

We have had 12 cases of acute obstruction of the bowel, also a group so small as not to warrant very definite conclusions. The reflexes were uninvolved in 7, in 4 no stress could be placed upon the loss or diminution because of age or relaxation. In one, a boy of seven, there was total loss of reflex—this must be regarded as an exception. We may tentatively conclude from these few cases that obstruction of the bowel commonly does not affect these reflexes.

We have also had a large group of miscellaneous cases, many of which were acute or subacute in character, and in which we found that the reflex varied. We have been fairly safe in estimating that when the reflexes were present, with no abdominal rigidity, that no very acute process invading the peritoneum was present. Collections of pus outside of the peritoneum were almost uniformly attended by normal reflexes.

Our observations have led us to the conlusion that the abdominal cutaneous reflex has a distinct, though limited value in acute conditions within the abdomen and that, although perhaps not as valuable a sign as rigidity (or lack of it), when combined with other symptoms, it is of value in strengthening our diagnosis.

In younger people with intact abdominal walls, since these reflexes are so constantly present, their involvement has a particular significance. In older individuals, or those with obese or relaxed walls (conditions, of course, frequently met with), the presence of reflexes has a far greater significance than their absence, and we have learned to place but little stress upon such absence in these patients. To be of value to the surgeon he must not only develop a uniform and careful technique, but must study the matter to some extent in order to make it of practical value in diagnosis. To place too much value upon it would lead to frequent error, as is the case with most of our diagnostic signs.

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DISCUSSION

Dr. Philander A. Harris.—I think the Council of the American Gynecological Society made a slight error in selecting me to open the discussion on the paper of Dr. Smith, although the members of the Council knew that I had presented a paper at the New York meeting of the Society some years ago on the location of pain in visceral disease and an easy method of determining it. Evidently the Council had that contribution in mind when they selected me to discuss this paper, but that work was quite different form this. The work I undertook at that time was to have patients coming in to touch the centres and areas of pain and then have the nurse mark the places indicated, and all markings were transferred to the history books, and so in that way we had a perfect record of the areas of pain that patients complained of. This is quite different from the matter of cutaneous reflexes.

I have been much interested in Dr. Smith's paper, and I am sorry some neurologist in Boston is not here to discuss it. I believe this method of eliciting the reflexes will show something, and I do not think it should be ignored. I think it is up to Dr. Smith to report further upon this subject, although the paper he has presented is an excellent one. He has shown us that this cutaneous reflex is synchronized with the other active movements in the case. I refer to pain, to tenderness, fever, and leukocytosis. When a patient is sick these things show, so that perhaps this art of testing and recording reflexes may be added to our criteria as an aid in diagnosis.

COMPLETE STERILIZATION OF THE SKIN BY IODIN

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Washington, D. C.

In my paper read before this Society at its meeting in 1911, practical skin surface sterilization by painting it at a few minutes' interval, with two coats of 3.5 per cent. of iodin crystals in 95 per cent. alcohol was attained. That weaker solutions of iodin were unreliable for this purpose was also contended therein. Extension of the field of application of this remedy to the endometrium, Fallopian tubes, and peritoneum has been made in my practical work since 1911. Since then others have made bacteriological investigations of the subject with findings, some confirming and others tending to disprove, mine. Robb[1] has decided from his bacteriological work (*loc. cit.*, p. 327) that "Sterilization with tincture of iodin is not to be relied upon, and should be used only when more elaborate forms of sterilization are contra-indicated." He states he has never employed it in his surgical work. This dictum may be said to have fallen on sterile soil, as iodin sterilization is today the usual method and is notable in such large clinics as those of the Mayos and Crile, the latter of whom works in the same institution with Robb. I dare say the practical employment of this method during the past four years has gained for it such preference that the time for its abandonment is not near.

[1] Surg., Gyn., and Obst., 1913, xvii, 324.

Your attention may reasonably be asked to the element of technical errors in bacteriological work in the way of contamination. Possibly it may offer a reason for the marked disparity in the bacteriological findings already mentioned. Lacking in bacteriological skill, I did not attempt that portion of the work, but contented myself with applying the iodin and procuring the material for skillful bacteriologists. In my investigations previous to last year the late Dr. John S. Neate, microscopist to the Army Medical Museum, did the bacteriological work. He was very skillful, having been a trusted associate of the late Walter Reed before, during, and after the work of the Yellow Fever Board in Cuba, and when doing this work was actively engaged in studying iodin as a germicide for the Army Medical Corps, and particularly as a part of the first-aid package. Last year hospital internes, well trained in bacteriology, did the work for me in the investigations made to determine, by removal of the iodin before scrapings were made, whether bacterial growth was inhibited or destroyed. These experiments will be recited below. The bacteriological work done in the experiments this year to determine whether the whole thickness of the skin was sterile after the iodin method of preparation, was done in the laboratory of the George Washington University by Dr. J. B. Briggs, Professor of Bacteriology and Pathology.

In ten instances between May 9 and June 17, 1913 scrapings were made from skin prepared by the alcoholic solution of iodin mentioned (3.5 per cent.), and then subjected to thorough scrubbing with a sterile strong solution of hyposulphite of soda until the iodin color was gone, the patients being anesthetized at the time for operation. The technique and findings were as follows:

The following four specimens were used in the test in each of the ten cases. (1) A small amount of the solution of the hyposulphite was put in a bouillon tube as a control; (2) skin

scrapings two minutes after the application of the second coat of iodin were put in some bouillon in tubes; (3) same as 2, except scrapings were made five minutes after the second painting; (4) skin scrapings from the same field after thorough washing, scrubbing and decolorizing by the sterile hyposulphite solution.

RESULTS. At the end of five days' incubation the forty specimens from the ten patients showed absolutely no growth.

In attempting to determine whether perfect sterilization of the skin could be produced by the painting with iodin the following technique was used in preparing the specimens for the bacteriologist. The skin was lightly painted twice (the patient being anesthetized for operation) with the iodin preparation and a strip of skin 4 x $\frac{1}{2}$ to 1 inches was cut from the median line of the abdomen, two minutes after the last coat was applied. This strip was at once dropped into a container in which was one quart of normal salt solution. Some of the same solution was previously put into a bouillon tube as a check. The tube and large container were taken to the laboratory and turned over to Dr. Briggs. In Case 1 the iodin was of 10 per cent. strength, but in all of the other 11 it was the same as I have for four years used in surgical operations, 3.5 per cent. The interim between the coats varied from sixteen minutes to ninety-two minutes and the number of experiments was twelve. In the last five a vigorous culture of Bacillus subtilis was rubbed into the skin, to be removed thirteen to eighteen hours before its removal and the area covered with a sterile dressing until the first coat of iodin was applied. These specimens were all transported a mile and not particularly well wrapped which may in a measure account for the contamination of the control solution in Cases 5, 6 and 12 noted in Dr. Brigg's report, which is here given. I am deeply obligated to Dr. Briggs for his careful

and interested as well as interesting bacteriological work here reported and which, in reality, I am scarcely more than reporting to you, or recording, by this paper. Dr. Briggs' report is as follows: Specimens examined, 12, between January 29 and March 27, 1914, all with salt solution controls and the last five with subtilis skin infection before operation.

Procedure. In all cases the solutions, either of control, if provided, or direct from the fluid containing the skin strips, was dealt with as follows:

1. Four drops were removed with a sterile pipette and inoculated on one agar slant and in one tube of plain, 1 per cent. dextrose broth (2, 8, 12) from each specimen.

Result. Scattered Staphylococcus albus colonies on agar appeared in three cases (5, 6, 12); moulds grew out on the second to the fourth day in two cases (3, 6); Staphylococcus albus in broth (5, 6, but not 12) and subtilis (contamination from air?) in only one (10) case.

2. One to three cubic centimeters were removed with sterile pipette, added to broth tubes, inoculated with stock Staphylococcus aureus, and incubated.

Results. All positive. In the dilutions used the salt solutions were not inhibitive of pyogenic cocci.

The skin strips were handled as follows:

1. A pea-sized bit was cut (with sterile instruments), washed, drawn over agar slants or pour plates, and then incubated (5 cases).

Results. No growth (1, 3, 5); a mucous type of mould grew after three days (probably a contamination) in Case 2 scattering (four to six on a slant) colonies of Staphylococcus albus (12).

2. A piece from 0.5 to 1 cm. long was cut under the usual precautions, slit up into "feathers" with scissors and dropped into a tube (4, 6, 7) or flask (8, 9, 10, 11) of broth. If there was no clouding and smears and hanging drops were negative

in seven days the result was considered to evidence complete sterility.

Results. No growth (4, 2, 7); no growth for twenty-four to thirty-six hours, followed by slow development of subtilis (8, 9, 10, 11); in 9 and 10 secondary inoculations into fresh broth gave active growth, showing in flasks with skin the subtilis was inhibited.

This report shows that the salt solution containing the skin pieces was not inhibitory to bacterial growth; that the skin was sterile in practically every case, the few instances of growths being reasonably attributable to contamination, and that the Bacillus subtilis was killed. The spores of this latter species are known to be remarkably resistant, being able to withstand a 1 to 1000 solution of mercuric chloride for periods up to one hour. This notable resistance prompted their employment in this series of experiments. I have not been convinced that a 10 per cent. alcoholic preparation of iodin will not destroy these spores in from two to five minutes, even when painted on the skin. In fact, I am inclined to believe the extent of the germicidal power of iodin depends more than a little on the manner of its application as well as upon the strength of the solution used. If the coating be made at first thick before a thin one is allowed to dry the penetration should be deeper or the deep penetration more perfect. If a thin coating is first made the skin recesses may be but partly filled and when evaporation of the iodin has occurred a thin, impermeable barrier of iodin is left. Whether this layer is free iodin or an albuminoid salt I am not prepared to state at this time. If the latter, then its removal from the skin for technical purposes may be much more difficult than we would like. Turner and Catto[1] in their investigations used a watery solution (*loc. cit.*) and with that found growths in but 3 cases of 32 used. The did not, however, remove the iodin from the skin as a pre-

[1] Lancet, London, 1911, i, 733.

liminary step to their cultivating the skin pieces in nutrient broth for a period of seventy-two hours. This we have done in the work herein recorded and feel we have met the objections raised on that score by the critics of our earlier work in this field. I expect later to determine whether a preparation of iodin, stronger than used in this work, will destroy the spores of the subtilis in the skin recesses.

IODIN AS A STERILIZING AGENT IN SUPRA-VAGINAL HYSTERECTOMY: WITH REMARKS UPON MORBIDITY

By I. S. Stone, M.D.
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The low rate of mortality following hysterectomy appears to have satisfied the surgical mind, if we may rely upon the output of literature upon this subject. Since the comparatively low rate of 5 per cent. has been attained by many operators, and a still lower rate by a few, we note the rarity of remarks upon the morbidity which must still exist and which should be minimized if not eradicated.

It is unnecessary to repeat or to discuss the findings of those claiming the absence of infective bacteria in the uterine canal. Everybody known that the vagina contains many varieties, and some say that these are good enough to penetrate only a short distance into the cervical canal. However this may be, all of the hysterectomists fear infection about the stump, under the bladder, reflexure, or between peritoneal folds, as after the removal of an intraligamentary growth.[1]

Our efficient secretary, Dr. Broun, has discussed this subject in *Amer. Jour. Obst.*, New York, 1901, xliv, p. 792, and his paper appears to be the last word we have been able to find. In this paper Dr. Broun has mentioned the practice

[1] The deaths from embolism which the writer has reported elsewhere occurred in patients with infection under the flap.

in vogue at that time, namely, the drainage of the cervical canal or the space above the cervix through the canal. In common with many, the writer also drained many of his cases, and with the result that an improvement was shown in diminished morbidity. Every variety of method, such as gauze or tube drainage, and the removal of the cervix was practised by many to promote drainage. The writer has always found good results follow these methods. There is a very small mortality after total hysterectomy for fibromyomata, and the practice of some kind of drainage is desirable in the absence of a definitely sterile field through which to make the amputation of the uterus.

With the nearly perfect results of skin sterilization we shall not deal at present, but the application of iodin alcohol to the vaginal and uterine mucosa has been productive of results which appear to approach the ideal. The patient is brought to the operating table after the proper examination has been made, which shows her condition to be satisfactory for operation. She is placed in the lithotomy position and a 25 per cent. (1.75 iodin) diluted alcoholic tincture of iodin is applied over the genitals and introitus vaginæ. The catheter is used immediately after this, and a perineal retractor introduced into the vagina and a volsellum used with which to grasp the cervix. The cervix is dilated to admit the conical nozzle of a 2-ounce glass syringe. An ounce of the same 25 per cent. iodin alcohol solution is then slowly injected into the cavity of the uterus. The fluid is not allowed to remain as long, nor is great force used as we have advised elsewhere.[1] After the injection the cervical canal should be again gently dilated to make sure of the discharge of the excess of the solution. Every part of the vagina is exposed and the assistant who makes this applica-

[1] See Virginia Med. Semi monthly, Richmond, Virginia, 1912–13, xvii, 105; and Jour. Amer. Med. Assoc., 1913, lx, 656, a paper prepared for the Association meeting for 1912.

tion to it makes this feature of the technique an important one. The operation is preceded by a second application of iodin to the skin over the abdomen, the first having been made before the anesthetic was given. After this the operation proceeds as usual and a final application of the iodin alcohol is made to the stump before closing the flaps if there is the slightest intimation that infectious matter has been handled, such as in an appendix, pus tube, etc. Finally the iodin solution is applied over the closed abdominal incision before the usual gauze dressings are applied.

DISCUSSION

DR. WILLIAM E. STUDDIFORD.—I would like to ask one question. Has Dr. Stone in any case in injecting iodin into the uterine cavity found that it has been forced through the tubes into the peritoneal cavity, and if so, has it caused any disturbance?

The reason I ask the question is that it will have some bearing on a little experience of my own: In the course of the winter I attempted to have *x*-ray pictures made of the uterine cavity, and for the purpose attempted to inject collargol into the uterine cavity in the cases of movable retroversion. My object in getting the *x*-ray picture was to note the position of the uterus, if I could get suitable pictures, and replace the uterus by inserting a pessary, and after the second *x*-rays did not know whether the uterus had been raised. A small amount of collargol was injected without pressure, and within six minutes of the injection the woman had a most intense colic, so much so that it was necessary to give her morphin, and I should say that these injections were made about two hours previously to putting her under the anesthetic for operation. On opening the abdomen to my surprise I found most of my collargol was in Douglas' pouch and both tubes were filled with the fluid. I was disturbed naturally, but proceeded with the operation, and the woman had no unusal symptoms and made a perfect recovery. I won-

dered if such accidents would happen or have happened with injections of iodin, and whether it caused any bad results on the peritoneum.

Dr. William P. Graves.—In connection with what has been said it may be interesting to report Döderlein's experiments described in Küstner's *Handbuch f. Gynäcologie.* During the performance of the operation for hysterectomy, in which the tubes were not diseased, he had the uterus injected with iodin and other colored substances. In every case the liquid appeared almost immediately at the fimbriated ends of the tubes and dropped into the perineal cavity. It seems to me that the injection of iodin into the uterine cavity might be a dangerous procedure. I have never used the iodin injection and I think that the figures in my series of supravaginal hysterectomies would show that it is not necessary. I have these figures with me, having taken them down in preparing my statistics for the discussion of Dr. Frank's paper.

There were 392 cases of supravaginal hysterectomy without operative mortality. One patient died of typhoid fever in the hospital, but as the typhoid symptoms came on after recovering from the operation I have not counted this as an operative death. Of these cases 5 had septic parametritis: all five operations were for purulent pelvic inflammation and were therefore septic to start with. Of the 392 cases there were 9 of parametrial hematoma, which Dr. Stone has mentioned. These parametrial hematomata are due to incomplete hemostasis and are the result usually of careless technique. I consider the intracervical injection of iodin as entirely unnecessary for the success of a supravaginal hysterectomy.

Dr. Henry T. Byford.—I would like to ask what is supposed to be accomplished by the iodin? Is it merely to sterilize the cervix near the point where the incision is to be made so that the operator will not cut into a septic mucous membrane? If that is all, the question is whether it is more harmful to the patient to use this injection with possible irritation of the peritoneum than to cut into a more or less septic mucous membrane. I do not think any of us have had any trouble with the cervix, because when we cut into it we disinfect it just as thoroughly as if it had been previously disinfected with iodin. If that is all we can accomplish by it, it is a question whether the means would justify doing it.

Dr. Reuben Peterson.—Dr. Stone brings up the interesting question of whether we should or should not sterilize the cervix with iodin before hysterectomy. If this ought to be done, and clinically it shows it ought to be done, it seems to me it is our duty to do it because, as he has shown, it can be done very easily, but I think the burden of proof is upon Dr. Stone. Certainly, there cannot be very much danger if Dr. Graves can report 391 cases of hysterectomy without morbidity or without mortality. The danger must be very slight, and the injection of iodin prior to the operation is a time-consuming element at least, so that if we can do away with this, or not employ it, it is far better to do so. Occasionally I have thought there were times when I may have infected a patient from a supravaginal amputation; I was not sure but that infection might have come from that source, but in the majority of cases I think such a procedure is unnecessary. I do not think we are in a position to compare charts with Dr. Stone unless we have looked up the question throughly. We can only gain a general impression, and my impression would not be very valuable, because long ago I found out from my own clinical work that the taking of temperatures by the mouth by the ordinary nurse was perfectly valueless so far as observations were concerned. If you will watch the ordinary nurse take the temperature by the mouth I think you will agree with me that there is a great deal of imperfection in this method so far as accuracy of our records is concerned; whereas taking the temperature the other way is more or less accurate. I do not believe we will be in a position to discuss sepsis following hysterectomy with or without the use of iodin unless these temperatures were taken more accurately than those shown by Dr. Stone.

Dr. J. Wesley Bovée.—I would like to say to Dr. Studdiford that practically all of my work in the pelvis, is preceded by sterilization of the vagina and uterine cavity by iodin. If I am to do plastic work in the vagina, or plastic work on the perineum, or abdominal work, or pelvic work transperitoneally, I sterilize the genital tract as far as the fimbriated ends of the tubes from below with the iodin, and I have been doing this uniformly for two years at least. I never inject the uterus with iodin without the patient being anesthetized, and I would expect really, if I injected the uterine cavity, particularly with any degree of

pressure with iodin or with collargol, a disagreeable effect. We know the marked pain we get from injecting the renal pelvis pelvis with collargol. The patient usually has a colic as a result of it.

As to finding material in the peritoneal cavity and passing to the Fallopian tubes, I would call attention to the fact that he saw no bad effects from it, and I published my experience two years ago in this line as to the feeling I had at first in finding the peritoneum or abdominal wall stained as we open it and find it stained as with blood in cases of ruptured tubal pregnancy, and that I watched patients with alarm and was amazed to find they did beautifully. They had no pain the next morning, although there was great peritoneal inundation with iodin. So that I have come to disregard absolutely any effect upon the pelvic peritoneum from iodin, considering it perfectly harmless. In many cases in attempting to inject the Fallopian tubes with iodin I have failed to do it, and have in turn, when opening the abdomen, injected it through the fimbriated ends of the tube because I failed to reach them through the cervix. I have a little mental reservation regarding injection with high pressure. I fear we get a certain amount of collapse from injecting the uterus under pressure. I think it is the effect of the sudden pressure in the uterus, the sudden distension, rather than the chemical used. I think if we were to use sterile water, we would produce the same effect. So I am particular because two or three years ago I had two or three cases in which I noticed considerable shock immediately after the operation under pressure.

One does not do supravaginal amputation simply for fibroids. I am doing that operation myself in cases of fibroids and pus cases in which I remove the cervix. When one gets into the habit of doing that it seems he is lessening the dangers by getting rid of a useless cervix after removing the body of the uterus. I have not examined my cases after operation as carefully as Dr. Stone has done, and I see no occasion to do it. But so far as the iodin is concerned I am an absolute devotee of it. I think it is better to resort to sterilization of the parts in advance rather than to cut across an unclean field and take chances of sterilizing it afterward. We know the vagina is invaded by germs in which there is a lacerated perineum with a large opening. We have germs coming in and going out with respiration

from the atmosphere, and I think it is much better to have the tract sterile than in cases of emergency to go into an unclean field.

With regard to hemostasis, I rely on the Downes' electrothermic angiotribe, as I get better results with it than with the use of the ligature.

Dr. I. S. Stone (closing the discussion).—As to the injection of the tubes with iodin, the remarks of Dr. Studdiford have been answered pretty well by Dr. Bovée. I wrote a paper in 1911 or 1912, and another one in 1913, in which I went over the ground of injection the tubes through the uterus. I have had considerable experience in doing that in the last eighteen years.

As to the possibility of working out a scheme to photograph the Fallopian tubes by the injection of collargol, as Dr. Studdiford has said, I never inject the uterus with any pressure except when the patient was to be operated on and the abdomen opened immediately afterward, and it is not necessary to do so. We do find certain cases where it seems impossible to inject the tubes themselves or to reach the tubes so that we have definite evidence of it.

Dr. Graves is in a class by himself. He has a splendid record, and while I have reported a comparatively small number of cases as compared with him (about 160 hysterectomies), my mortality has been a little less than 2 per cent. It is difficult to go on without occasionally striking cases where it is unwise to operate at all, and that knocks down our percentage of recoveries. I have only lost cases from embolism where there was infection about the stump. I may have had cases of phlebitis that were not discoverable; the disease may have developed behind the peritoneum, and was not manifested in the extremities. The cases of embolism from infection about the stump caused me to be more painstaking in trying to sterilize the uterine mucosa before the amputation is made.

As to Dr. Byford's remarks, the only way infection is introduced is when the uterine canal is opened. But you cannot sterilize the wound areas after it is once infected from the uterine canal; but such contamination can be prevented. We should strive to make the amputation through a comparatively clean tract.

PAPERS

PRESENTED TO THE COUNCIL BY THE

CANDIDATES ELECTED TO FELLOWSHIP

AT THE

THIRTY-NINTH ANNUAL MEETING

THE DYNAMICS OF THE FEMALE PELVIS; ITS EVOLUTION AND ARCHITECTURE WITH RESPECT TO FUNCTION

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A consideration of the facts pertaining to the process of parturition in the human female leads one to the conclusion that herein must lie one of the disharmonies of function and structure so elaborated by Metchnikoff.

The entire group of reproductive phenomena should naturally occur as a purely physiological cycle, with no pathological element entering at any time, in the case of the normal healthy female.

This physiological cycle is, however, broken at two points in the usual normal pregnancy (1) by the occurrence of the toxemia of early pregnancy, the nausea and emesis of the first few months, and (2) by the trauma and exhaustion of labor, due mainly to the difficult passage of the fetus through a bony canal not entirely adapted for its reception and egress.

Inasmuch as natural laws, insofar as known, are always logical, there must be some definite cause underlying the difficulties attending the birth of a child, and in the opinion of the writer the existing disharmony may well be explained by a study of the evolution of the pelvis. In the evolution of any structure or group of structures one is impressed by the constancy of a law which is, broadly expressed, that morphology always follows function, or the anatomy of a

part alters to suit a changed physiology with such modifications as are necessary to fit each part properly to interact with the other structures comprising the entire animal.

If this law be applied to the subject under discussion it will be apparent that in the development of the present type human being two great functions of the lower animal form have been widely changed, the assumption of the upright position on the part of man, and the enormous increase of intellectual power, necessitating a change in the form of the head to contain the expanded brain.

According to the terms of the expressed law, such change in function would, of necessity, be followed by an altered morphology. In the pelvis there must have taken place such changes as would permit the trunk to be carried erect and such modification of the contour of the cavity as would allow the passage of the enlarged cranium of the child.

The second clause of the law becoming operative will explain this seemingly imperfect evolution to suit the changed conditions as due to some related necessity for the fulfilment of an independent function of the pelvic girdle. All the uses of this bony group must therefore be examined.

The main functions of the pelvis are, five in number: (1) to attach the legs or hinder limbs to the trunk; (2) to furnish points of attachment and fulcra for the great muscles which move the limbs, and, in the case of man, hold the trunk erect; (3) to provide egress and support for the terminal canals of the intestinal and urinary systems; (4) to provide for a birth passage; (5) to act as a shelf and support for the abdominal viscera.

All of these functions are perfectly served by the architecture of the pelvis in quadrupeds and accordingly, in these forms, the disharmonies of reproduction do not occur, in so far as they refer to parturition. As the evolution of man proceeded, however, the structure of the pelvis with respect to its functions became modified, necessity developing one

phase of its form at the expense of others until the resulting construction may be said, in man, to be a mechanical unit so altered by change in its use as to be more or less imperfect as concerns one important purpose of its existence, that is, the process of parturition.

The development of the human pelvis was influenced also by another fundamental law of evolution: that of natural selection.

It is apparent that the earliest females of the species were or were not able to give birth to young according as their pelves had widened sufficiently or not, and those who were unable to bear, either remained sterile or died in labor, with the result that all breeding was carried on by the females with wide pelves. Such a course of events naturally rapidly bred out the quadruped type of pelvis in the developing race.

If one were asked to construct a pelvis around an ideal bony canal for the passage of the human fetus, it would doubtless take the form of a funnel-shaped, bony basin, its cavity corresponding accurately to the contour of the flexed fetal head, and its segment of greatest contraction as short as consistent with rigidity sufficient to resist the pull of the great muscles.

There should be no obliquity of conformation, the bony canal being at the same height at all points.

Such a passage would oppose no obstacle to the descent of the fetus even at its bony segment, where, by reason of the mechanically perfect fit of the parts, the fetal head would pass unhindered, being opposed only by the elastic muscles and fascia.

In this ideal pelvis the length of the symphysis would be decreased as much as compatible with the factor of safety, the sacrum would be of exactly the same length, the promontory would be absent, and the pelvic cavity in its entirety would lie in a plane horizontal to the long axis of the mother and fetus, with possibly a slight slope downward

anteriorly. It is noteworthy that the pelvis just described would, by reason of the absence of all inclination, prevent the process of internal rotation of the fetal presenting part, so important a phase of the mechanism of human parturition, but this very process of internal rotation is at best a compromise on the part of nature to compensate for the obliquity of the human pelvis, necessary for the maintenance of the upright position and in itself, is not an integral or even mechanically desirable method of accomplishing the object in view.

Internal rotation does not occur among quadrupeds and first appears, in so far as is known, among the anthropoid apes.

With regard to the single purpose of acting as a channel of egress for the fetus, the ideal birth canal as described would be perfect, but it must be remembered that all the functions of the pelvic girdle, some of them of constant, vital necessity, must be considered, and that it is the combination of uses, the modification of one detail to permit the introduction of another, which has resulted in the human type of pelvis as it now exists.

In order to well understand these various alterations and modifications as they occurred, it is essential to trace the evolution of the vertebrate pelvis in detail through the several animal groups in which such structure is found.

The pelvis makes its first appearance in the fishes, in which it consists of poorly developed, bony structures not fixed in position. Only the hemapophyseal portion of the pelvic arch is developed, and is always in connection with the ventral fins.

Fishes have isolated ischia, which are subtriangular, cartilaginous plates, supporting the fins by their expanded ends and either freely suspended in the muscular tissue or attached by their narrower ends to the coracoid process. In no fish is the incomplete pelvic arch directly attached to the vertebral column. (Owen.)

In most of the species the pelvis is represented by homologues of the ischia alone, but in a few Chimeroids there are found short, narrow processes, which extend above the place of articulation of the ventral fin and which simulate iliac bones (Fig. 1).

In reptiles the pelvis becomes more definite and the homologues of the integral structures may be distinguished.

In the frog (rana) and the toad (bufo) the impulse of the hind limbs is applied to the hindmost part of the body, beyond the greatly lengthened coccygeal style, by the remarkable backward prolongation of the ilia which expand and unite, forming a symphysis above the acetabula. Thence the impulse of the limbs is transmitted to the short and strong transverse processes of the sacrum. A pair of commonly anchylosed semicircular, bony plates, the ischia, unite with the iliac symphysis to form the lower half of the articulation for the femora (Fig. 2, *a*, *b*).

The Chelonia (turtles) offer an important phase of pelvic evolution, since in them the ossa innominata retain throughout life the threefold character seen in the human fetus, but the relative value of the separate bones is reversed. The sacrum is small and from its two centra short processes converge and afford a close ligamentous attachment to the proximal or upper ends of the ilia. These bones are also attached to the central plates of the carapace which they support as stout, strong pillars.

They slightly expand at their acetabular ends, when each unites with two other bones, the ischia and the pubes. A short, slender, straight ischium running transversely across the posterior aspect of the pelvis, and a broad, expanded pubis very comparable to the human ilium, which forms an extensive symphysis and affords strong ligamentous attachment for the plastron as well as a foundation for the iliac pillar which supports the carapace (Fig. 3).

In the crocodile, the ilium unites with the posterior hema-

pophysis to form the acetabulum, at the expense of the pubis, thus repeating the articular character of the coracoid in the shoulder girdle, while the long, slender pubis, placed anterior to the joint abuts against the abdominal sternum. The ilium is a short, broad bone entending beyond the two sacral vertebræ to which it is articulated, and it descends vertically to the acetabulum, of which it forms the upper half.

The ischium develops a strong, bent process from the fore part of the acetabular end to which the pubis is articulated. As it descends and inclines inward it becomes flattened and expanded and joins its fellow by an ischial symphysis. The slender pubis is directed forward and inward; no true obturator foramen is defined, but a wide opening exists between the bones (Fig. 4).

In birds the coalescence of the vertebræ to form the sacrum is carried to an extreme, a large number of the bones being involved, thirteen to seventeen fusing in a number of the species.

Generally the large sacrum forms the entire pelvic roof in birds, the ilia, ischia, and pubes being firmly attached thereto and so converting the pelvis into one complex mass of bone. The iliac, ischiac, and pubic elements are developed as distinct bones, but speedily coalesce at their point of junction about the acetabulum and usually elsewhere.

The ilium in birds is remarkable for its development in the direction of the axis of the vertebral column, extending its connection with many more segments than its own; it is accordingly long and narrow but thickened midway, where it constitutes the upper wall of the acetabulum.

The ischium is a long, narrow flattened bone, thickened where it forms the back part of the acetabulum, thinner and broader as it passes backward and generally placed parallel with its fellow.

The pubic bones are directed backward, with usually a convex curve outward and terminate freely or are united to the ischia above, the pelvis being an open one as a rule.

The pelvis of birds differs from that of cold-blooded vertebrates in the greater number of vertebral segments entering into its composition, and in their bony confluence. It differs from that of mammals by being unclosed by an anterior symphysis and by the widely perforate acetabulum.

The large size and brittle shell of the egg are the teleological conditions of the open pelvis and the transference of the weight of a horizontal trunk upon a single pair of legs, necessitates an extensive union of its segments. When the legs require to be pulled far and strongly back as in diving, the origins of the requisite muscles are extended far beyond the centre of motion of the limb.

When the bird walks or hops, using the legs chiefly in grasping or perching, the pelvis is short and broad, especially behind; in certain cases the breadth may exceed the length (Fig. 5).

The form of the pelvis in the preceding classes, as well as in the lower orders of mammalia, plays no part in the function of reproduction, since in all of these forms the ova or young are so much smaller than the pelvic opening that their passage is not noteworthy. The exception to this generalization lies in birds which lay eggs, often of large relative size. In these animals, however, the pelvis is open below and anteriorly and thus provides for the egress of the large product of conception.

The absence of the symphysis is compensated for, as has been described, by the great size and extensive articulations of the sacrum.

It is only when the higher orders of mammalia are approached that the pelvic morphology becomes of importance with respect to parturition. It is necessary, however, to hastily survey the anatomy in all the vertebrate forms

that an orderly review of the facts of pelvic evolution may be obtained.

The lowest mammalian order is that called Monotremata, of which the ornithorynchus and the echidna are the only known representatives. In these animals the pelvis resembles that of reptiles in the length of time that the innominate bones retain their threefold character.

In the echidna the acetabulum is perforate as in birds.

The entire pelvis is short, heavy and flat; the ilia being strong, short, triangular bones, their beams expanded and a trifle flared out. The ischia are also short, somewhat triangular bones, their tuberosities broad and blunt and directed sharply backward. The pubes are of smaller size and give off two spinous processes, one notably long. The pubes and ischia unite to form the obturator foramen and the short symphysis which closes the pelvis anteriorly.

The marsupial bones are long, flat, triangular forms which are attached along what corresponds to Poupart's ligament, from the symphysis to the spinous process of the pubes. They are relatively long in this order and are directed forward and outward with the animal in its normal horizontal position (Fig. 6 *a*, *b*).

The pelvis of the order Marsupalia is characterized by certain essential morphological peculiarities. The entire structure forms a rough triangular prism, the parallel lateral walls formed by the two ilia and ischia (which lie in the same plane) and by the long symphysis pubis.

The ilia themselves are also triangular prisms in form, with practically no flaring out of their crests. One exception to this form occurs in the wombat, in which the iliac bodies are considerably curved outward at their anterior extremities.

The ischia are heavy, angulated bones, their tuberosities not curved outward but maintaining the general prismatic form of the pelvis. The pubes are slender and possess very

marked spines. The symphysis is a long joint, usually of a length about one-half that of the entire pelvis.

The sacrum is wedge-shaped, the promontory not marked, the sacro-iliac joint possessing considerable range of movement in the young animal. The marsupial bones reach their greatest development in this order and are, in form, two flattened, elongated, narrow, bony plates which are usually articulated with the pubis and are firmly attached to the pectinate ligament. Homologically these bones are the last pair of lumbar hemapophyses advanced to an osseous state. They exist in both sexes and serve as a point of origin of the pyramidalis muscle.

The essentials of the marsupial pelvis are the triangular outlet, the parallel lateral walls, the outlet five or six times the size required for the passage of the fetus, which is very small and immature; and the presence of the marsupial bones.

The angle of the true conjugate is about 80 degrees (Fig. 7, *a, b, c, d*).

The order Rodentia presents a large variety of creatures, about three-fourths of the known species of mammals being included in it, and in consequence the morphology of this great number of species is exceedingly diverse. There are rodents whose mode of life requires limbs fitted for rapid running, others that climb, some that burrow, some that leap, and a few that progress by a form of flight.

In the hares and rabbits the pelvis is relatively large, the ilia long and flattened and having a short sacral articulation, the joint being limited to one vertebra. The pubes are long and slender, meeting to form a long symphysis about two-fifths the entire pelvic length. The outlet is slightly ovate in section, or better triangular, the sides of the triangle somewhat convexly curved. The sacro-iliac joint is freely movable, especially in young animals.

In the porcupine (Hystrix cristata) (Fig. 9, *a*, *b*) the ilia are truncate, their crests well widened, the sacro-iliac joint a large synchondrosis with free motility. The pubes are slender and long, forming a very obtuse angle with the ilia and uniting into a very narrow symphysis, about one-tenth the entire pelvic length. The outlet is roughly circular, the anteroposterior diameter slightly longer than the transverse. The obturator foramen is very large, the tuberosities of the ischium are prominent bony points, and the pelvis is large and roomy throughout. The angle of the true conjugate is about 70 degrees.

In the guinea-pig (Cavia cobayia) the pelvis is long, narrow, and laterally compressed, the outlet being much smaller than the head of the mature fetus.

The ilia are long and narrow, the pubes slender and lying almost parallel with the ilia, the symphysis very short.

Prior to parturition the symphysial ligaments become soft and extensile and the ossa innominata, gliding on the sacro-iliac joints, diverge at the symphysis to an enormous extent. After labor is complete the symphysial ligaments quickly undergo involution to their normal length and the pelvis resumes its usual state.

The fetus of the guinea-pig is far advanced at birth, some of the deciduous teeth being shed in utero (Fig. 11, *a*, *b*).

In those rodents adapted for a subterranean life the pelvis is characterized, as in other burrowing animals, by great narrowness, as its only striking peculiarity.

The rodent pelvis is difficult to summarize morphologically, by reason of the great diversity of form occurring in the many species of the order, but it may be said that here the pelvis is usually of a type rather higher in the scale than the other structural characteristics of the order would indicate. The outlet is more commonly ovate than rectangular, the ischia and ilia lie at a more marked angle to each other, and the true conjugate forms a lesser angle than

is common in quadrupeds. The sacro-iliac joint is, in general, freely movable (Fig. 8, *a*, *b*, *c*).

The order Insectivora, like rodentia, contains species fitted for leaping, burrowing, swimming and flying as well as for ordinary terrestrial progression. The pelvis among these animals is variable as to form, but in general is relatively large, the sacro-iliac joint well marked, the symphysis short or entirely wanting, the pubes being separated.

In the hedgehog, for example, the pelvic outlet is large, the sacrum narrow, forming a long articulation with the ilia, which leave the spinal column at an angle of about 130 degrees. The symphysis is short and slight, the sacro-iliac joint freely movable.

In the bats the ilia are narrow, subcylindrical bones, firmly united to the sacrum and lying parallel to the spinal column. The pubis is continued on a line with the ilium to the symphysis, which is but slightly closed in the male and remains entirely open in most female bats. The ischia join the last sacral vertebra and help bound a sacrosciatic foramen. The shallow acetabula are directed outward and backward.

The order Bruta is of some especial interest from its direct relationship with some of the giant fossil mammals, the Megatherium and the Glyptodon groups. One family, the armadillos, are peculiar in that anchyloses are found in great number and in unusual regions among them. The pelvis is formed of the coalescence of the ilia and ischia with the sacrum, which is formed of the fused eight sacral vertebræ, which, rather than decrease in width as the caudal appendage is approached, progressively grow wider to form a long, bony union with the ischia and the pubes. The tuberosities of the ischia and a long, bony process at the anterior portion of the ilia curve outward and upward, to form firm bony supports for the carapace with which these animals are invested. The pubes are long and slender and unite in a

very slight symphysis. The sacrosymphysial angle is quite 80 degrees. No movement of any pelvic articulation is possible and in this respect the structure is very comparable to that of birds (Fig. 10).

In the sloths and their relatives, the extinct mylodon, the pelvis assumes a different contour. Here the alæ of the ilia are flared out and expanded as in a pelvis of the human type. The sacroiliac joint is fixed, the long sacrum being fused with the ilia and the ischia. The pubes are long and slender, the symphysis extremely short. The pelvic outlet is almost circular, quite so in the ai.

Among the whales, comprising the order Cetacea, the pelvis is but rudimentary and there is never any evidence of vertebral confluence to form a sacrum. The pelvic bones, two in number, are larger in males than in females, and seem to serve as a point of origin for the erector penis and erector clitoridis muscles, as their only function. They are homologues of the ischia. In Balena mysticus there is found, beside the ischium, a smaller, slender, curved bone which represents the pubes. The junction of the two bones forms a rudimentary acetabulum to which is ligamentously suspended a bone of equal length to the pubes, but thicker and terminating in a transversely extended convex surface, to which is suspended a smaller rudiment of a tibia. This is the most rudimentary form of limb appendage known in mammalia, and the little bones forming it (8.5 inches in length in a whale of 28 feet) are suspended beneath the last two lumbar vertebræ, which may thus be regarded as answering to the sacral in quadrupeds (Owens) (Fig. 12, *a*, *b*).

In the marine order Sirenia, represented by the manatee and the dugong, the hind limbs are absent, as in whales, and the pelvis is also rudimentary. It is formed by an extension of ossification from the pleuropophysis of the second lumbar vertebra, which ossification is the homologue of the ilium. To this is attached a smaller bone, the ischium

which unites with its fellow of the opposite side, forming a symphysis ischii. There is no evidence of a femur (Fig. 13).

The order Proboscidæ, the elephants, possess pelvic characteristics peculiar to themselves. The entire pelvic girdle is massive and strong, and lies directly vertical to the axis of the spinal column, the ilia coming off the sacroiliac joint at an angle of almost 90 degrees. The ilia are large, fan-shaped bones, their alæ very markedly expanded, the anterior superior spine lying at the level of the acetabulum. They are sharply concave anteriorly and correspondingly convex on their posterior aspect; the bodies are extremely short. The ischia are short massive bones, their bodies lying parallel to the direction of the ilia, the tuberosity well marked. A line drawn from the tuberosity of the ischium to the middle of the crest of the ilium would pass through the posterior surface of the acetabulum. The pubes are short and unite with the ischia to form a long, strong symphysis which lies at an angle of about 30 degrees with the vertebral column. The vertical position of the pelvis is largely due to the very short bodies of the ilia; the angle of the true conjugate is less than 20 degrees. The sacro-iliac joint is long and heavy and possesses moderate movement in young animals. The acetabula are directed directly downward thus transferring the weight immediately to the head of the femur. The outlet is ovate. In the specimen examined the entire pelvic length was four feet, the symphysis 18 inches and the true conjugate 19 inches, the transverse 17.5 inches.

The crests of the ilia were 28 inches long (Fig. 14, *a*, *b*).

Perissodactyla is an order of mammalia containing groups of creatures widely divergent as to their external characteristics; for instance, the rhinoceros, tapir, and horse (Figs. 15 and 17).

In the rhinoceros the pelvis is of good size and directed vertically to the vertebral column. The ilia are flat, fan-

shaped bones, somewhat concave posteriorly but flat anteriorly. The short, heavy ischia form a slight angle with the ilia, their tuberosities spreading apart to form a wide pelvic outlet. The symphysis is short, the ischia playing but a small part in its construction. The acetabula are directed outward and downward. The angle of the true conjugate is less than 10 degrees.

In the horse the pelvic constituents are much the same as in the preceding species, but vary in the much greater length of the iliac bodies, which lengthening greatly increases the obliquity of the pelvis, it making an angle of about 135 degrees with the spinal column as opposed to almost 90 degrees in the rhinoceros.

The ilia are fan-shaped and flat, their bodies long and slender. The ischia are strong and straight, the pubes more slight, the symphsis a long joint about one-half the entire pelvic length. The angle of the true conjugate is about 50 degrees. The sides of the pelvis are parallel to each other, the outlet ovoid. The pelvis of the horse closely approaches that of the ungulates in its general characteristics (Fig. 17).

The order Ungulata, or Artiodactyla as formerly called, presents among its wide range of species, animals varying greatly in their external appearance, though the morphology of the pelvis is singularly uniform.

This order contains the pachyderms and the ruminants.

The hippopotamus possesses a heavy and massive pelvis, relatively large in size. The sacrum is broad and flat, the ilia with expanded alæ, curve upward from the sacroiliac articulation to reach almost the level of the sacrum itself. The iliolumbar angle is about 150 degrees. The ischia are heavy, their tuberosities expanded into a broad plate of bone. The pubes are more slender and form with the ischia a strong symphysis.

In the swine the pelvis is relatively longer and narrower than in the hippopotamus, but of the same general character.

In the ruminant members of the order the pelvic girdle is characteristic. The sacrum consists of four fused vertebræ, their spines coalescing into a ridge or crest. The sacro-iliac joint is large but possesses free motion. The iliolumbar angle varies somewhat but averages around 145 degrees. The ilia have their alæ expanded and flared out somewhat anteriorly (ventrally); their bodies are long and slender, with some increase of bony tissue where they meet with the ischia and pubes to form the acetabulum. The bodies of the ischia lie in the same axis as the ilia; their tuberosities are broad and expanded, forming wide bony plates which are directed usually parallel to the caudal vertebræ. The pubes are slender and short, uniting with the ischia to form a long, strong symphysis of two-fifths the entire pelvic length.

At the posterior end of the symphysis the ischia are separated, leaving a large, V-shaped notch at the posterior pelvic rim, the V bounded on each side by the tuberosities of the ischia.

The pelvic outlet is almost rectangular, the transverse diameter being to the anteroposterior as 12 to 19.

The lateral sides of the pelvis are nearly parellel to each other, the outlet resembling, in section, a sort of square trough. The obturator foramen is of good size and the acetabula are carried far backward by the great length of the bodies of the ilia (Fig. 16, *a*, *b*, *c*).

In the Carnivora the pelvis is fairly uniform in the several species with the exception of such aberrant forms as the seals and walruses.

The lion may be taken as a general representative of the order. Here the pelvis is relatively a rather small structure, though very heavily and powerfully made. The sacrum is a wide, heavy bone, consisting of three fused vertebræ, their spines separate and long. The sacro-iliac joint is strong and of large size. The ilia are broad bones, shaped somewhat like a paddle blade, concave on their external sur-

face and lying almost parallel to each other, their alæ slightly divergent. The bodies or beams of the ilia are wide and massive and the growth of bone surrounding the acetabulum is markedly strong and solid. The ischia lie parallel to the ilia and are slighter, their tuberosities well marked and spread apart a little.

The pubes are short and stout, the symphysis a very long, strong joint of more than two-fifths the entire pelvic length. The rami of the ischia are wide, bony structures forming a trough-like outlet. The pelvic cavity is roughly rectangular, the outlet ovate. The angle of the true conjugate is 75 degrees. The acetabula are directed laterally; the obturator foramen is of large size, the ischiatic notch only indicated by a small spine (Fig. 19, *a*, *b*, *c*).

In certain species considerable variation from the typical form occurs.

In the raccoon the ischia are widely separated, a large V-shaped opening appearing at the posterior end of the symphysis, and the pelvis being very flat from before backward.

In the badger the symphysis is exceedingly short, the pubes very sloped, the ischia flaring widely apart.

The Pinnipedia, or seals, must be grouped with the carnivora as they are morphologically of the same type but have undergone extensive structural modification to suit their marine environment. In them the pelvis is remarkable for the stunted development of the ilia and the length of the ischia and pubes. The symphysis is short and feeble and the symphysial ligaments have the same property of enormous elasticity during parturition noted in certain rodents.

The general characteristics of the carnivorous pelvis may be summed up as consisting of the long, strong symphysis, the parallel lateral pelvic walls, the great sacro-symphysial angle, and the marked separation of the bodies of the ischia.

The sacro-iliac joint is in general moderately movable.

In the order Quadrumana a great change takes place in the

construction and the mechanics of the pelvis. The monkeys habitually assume the erect posture for varying periods of time and, as many species are arboreal in their habits, and spend much time swinging from their hands in the tree-tops, the upright position becomes an almost constant one among these varieties.

In the lemurs, a group about which there has been some discussion among naturalists, some classing them with the insectivora, the pelvis is narrow, feeble and small.

The ilia are long and narrow, articulating with two vertebræ of the slender sacrum. They form an angle of 140 degrees with the lumbosacral vertebral axis. The slender pubes leave the ilia at almost a right angle, forming a very short, weak symphysis. The ischia are curved, short, and present well-marked tubercles, and the entire pelvis bears a strong resemblance to that of bats.

In the macaques the pelvis is long and relatively large, the sacrum wide and wing-shaped, the ilia articulating with its first and slightly with its second vertebra. The joint is short, the articular surface small. The ilia are very long and of an oar-blade shape, their anterior surfaces curved sharply outward until they occupy a plane almost horizontal to the vertical axis of the animal. They make an angle of 160 degrees with the spinal column. The ischia lie almost in line with the ilia, their large, expanded tuberosities extended well backward and widely separated. The pubes are long and make a right angle with the ilia; the symphysis is short, about one-sixth the entire pelvic length.

The acetabula are directed slightly forward, a small curve in the body of the ilia bearing witness to the upward pressure of the femora upon them.

The angle of the superior strait is about 60 degrees; the pelvic outlet is oval, the anteroposterior diameter greater than the transverse (Fig. 20, *a*, *b*, *c*). The structure taken as a whole begins slightly to approach the human type.

In the chimpanzee (troglodytes niger) a marked change is at once apparent. The sacrum is wedge-shaped, its articular surface large, and occupying the bodies of three sacral vertebræ. The ilia are large and wide, their alæ much expanded and concave anteriorly, causing the pelvic cavity to assume something of the basin form. The bodies of the ilia are much shorter, relatively, than in the preceding species, the acetabulum farther forward.

The ischia are stout, the tuberosities flattened, separated and directed well downward. The pubes form an angle of about 20 degrees with the ilia; the symphysis is short and its axis parallel with the lumbosacral line. The obturator foramina are small, the outlet ovoid, its anteroposterior diameter greater than the transverse one. The angle of the true conjugate is 65 degrees. The large sacroiliac articulation possesses but little motion (Fig. 21, *a*, *b*).

In the gorilla (Gorilla gorilla) the pelvis rather closely approximates the human type. The sacrum is wedge-shaped, composed of five fused vertebræ and presents a distinct concavity anteriorly; its articular surfaces are large and rough, directed slightly backward. The alæ of the ilia are widely expanded, their crests forming a large arc, though the widening is almost entirely forward of the sacrum and not behind it as in the case of man. The ilia are concave anteriorly and convex posteriorly, and form an angle with the spinal column of 150 degrees.

The pubes are directed forward, forming an angle of 100 degrees with the ilia. The ischia are heavy, their tuberosities massive and point downward; the acetabula are faced outward and slightly backward. The pelvic contour is oval, the anteroposterior diameter still greater than the transverse, but the ratio much more nearly equal than in any preceding species. The angle of the true conjugate is 70 degrees, the interpubic angle obtuse (Fig. 22, *a*, *b*).

In man the especial human characteristics of the pelvis

are most marked. The sacrum is a broad, wedge-shaped bone, its anterior surface deeply concave, its articular facets relatively much larger than in any other mammal, and roughly quadrate in form. The ilia are wider than their length, the great expansion of their alæ posteriorly, to afford support for the great erector muscles of the trunk, being a specific morphological feature. The bodies or beams of the ilia are more curved inward than the apes, and this fact, together with the decrease in the inter pubic angle accounts for the extension of the transverse diameter of the pelvis in man until it becomes considerably longer than the antero-posterior one, this being also peculiar to the human species.

The pubes are short and stout, the iliopubic angle acute; the acetabula are directed outward and backward. The ischia are short and heavy, their tuberosities massive, convex, and extending along the outer surface of the ischia almost to the acetabula.

The pelvic contour is oval, the greater diameter being the transverse; the symphysis is short and flat and the entire bony cavity of the pelvis is in one plane. The angle of the true conjugate is 55 degrees (Fig. 24).

The fetal pelvis differs from the adult in many particulars.

The bodies of the ilia are much more straight, their sides tending to lie parallel to each other as in quadrupeds. The interpubic angle is more acute, leaving a slight tendency to the triangular outline of the cavity.

The ilia are less expanded posteriorly and the concavity of the sacrum is less marked. It is only when the developmental forces have acted upon the pelvis during the years of growth and of bony coalescence that the ultimate form of the human pelvis is fixed (Fig. 23).

An analysis of the course of evolution in the mammalian pelvis reveals the fact that gross structural changes are not marked throughout the quadruped orders with a few exceptions.

In the order bruta, of which the armadillo may be taken as an example, there is a distinct reversion to the avian type, the fused sacrum and ilia and the general immobility of the pelvis.

In certain rodents the pelvic girdle assumes a form apparently much higher in the scale of life than the animal itself, but broadly speaking the quadruped pelvis may be described as a roughly rectangular structure, lying in a generally horizontal plane, with a slight slope downward posteriorly. The false pelvis is almost entirely wanting, there being practically no part of the bony tissues above the brim with the exception of the small upper portion of the ilia.

The ilia are usually comparatively long, narrow bones, their beams roughly parallel, their alæ commonly flared out, but never markedly so, their bodies narrow.

The ischia are long, their bodies continuous with and in line with the ilia, the tuberosities generally in the same vertical plane as the iliac crests.

The symphysis pubis is a long joint, averaging from two-fifths to three-fifths the entire pelvic length. The angle of the true conjugate, from the promontory of the sacrum to the top of the symphysis, is much greater than in man, 70 to 80 degrees being not infrequent.

The increased length of the symphysis naturally causes a wide variation between the true and the diagonal conjugate diameter. Whereas in man the true conjugate averages 11 cm. and the diagonal conjugate 12.75 cm., a ratio of about 110 to 128; in the lioness the true conjugate is 11 cm., the diagonal 22 cm., ratio of 1 to 2. In the deer the proportion is as 14 to 26, in the great kangaroo 10 to 19, in the macaque, 7 to 10, and in the gorilla it is as 18 to 22.

It will be seen that in the passage of the fetus under the promontory of the sacrum, it meets with no bony obstacle below, since the entire promontory lies anterior to the symphysis and has only soft tissues opposite it. The pelvic

contraction ring begins only when the fetus has passed under the symphysis and becomes inclosed within the lateral bony walls.

For these reasons the true conjugate is in no sense a measure of the pelvic size, since the difficulty in passage lies in the vertical dorsoventral diameter. The form of the pelvic inlet is only of importance so far as it concerns the vertical diameter.

It follows that in quadrupeds the possible rotation of the sacrum on its sacro-iliac joint is of the greatest value both in increasing the vertical diameter and by widening the pelvis by a separation of the ilia.

This movement of the sacro-iliac joint varies greatly among different species and is most marked in young animals during their first delivery. Later in life the joint becomes anchylosed.

The shape of the pelvic brim varies exceedingly among the orders and species. In the lower forms, as the kangaroo, it is of the shape of a narrow triangle; the triangular form becomes more and more widened as higher animals are reached, until, the sides becoming more and more concave, the brim becomes ovoid in the ungulates, the broader portion being above.

In all quadrupeds the anteroposterior (dorsoventral) diameter is longer than the lateral one.

The size of the pelvic cavity varies not so much with the relative sizes of the particular animals as with the number and form of the young.

It is obvious that in uniparous animals, as the mare, cow, etc., where one or at most twin fetuses are produced at a birth, a larger birth canal is required than in multiparous animals, as the dog or swine, where the young are multiple and naturally of relatively smaller size.

The pelvis in quadrupeds is constantly subjected to great forces, which must be in equilibrium at all times.

First there is the thrust upward, backward, and slightly inward of the femora upon the acetabula, this force being enormously increased when the animal is running or leaping. To oppose this thrust there is the sacro-iliac articulation, the flexible and elastic vertebral column, and the long, strong symphysis.

If the quadruped pelvis be resolved into its mechanical elements, the acetabula will be the point of application of a force directed upward, backward, and inward; the rami of the pubes and the ischia, together with the long symphysis, form an almost rectangular truss to withstand this force. The ilium is not permitted to bend inward by reason of the massive deposits of bone about the acetabulum.

The strong superior sacro-iliac ligaments hold the ilia firmly in contact with the sacrum and, together with the wide articular surface of that bone, act to prevent undue rotation backward and inward of the ilia upon the sacrum, when force is applied at the acetabulum.

The resultant action of all these forces is to maintain the straight-sided, long pelvis, the symphysis taking most of the leg thrust, while the sacro-iliac articulation acts as a brace and, to use a nautical term, a "preventer stay" (Fig. 25).

The shock of running and leaping efforts are not resisted by the pelvic joints alone, but the whole vertebral column assists in dissipating the force by alternate flexion and extension. A slight rotation of the ilia upon the sacrum does occur, but the movement is small in degree.

By a study of the drawings of the quadruped pelvis it will be seen that there can be no tendency to unequal movement of that structure, that is, one side of the pelvis rotating with the sacro-iliac joint as a center and a separation or sliding movement of the symphysis, that articulation being of such length and strength as to preclude any possibility of shearing or pulling apart. The importance of this fact will be seen when the forces involved in the maintenance of the upright position are studied.

EXPLANATION OF THE FIGURES.

In all the drawings the same identification marks will be used, as follows:

Sa = sacrum	cc = coccyx
Il = ilium	Fe = femur
Is = ischium	Ti = tibia
P = pubis	ac = acetabulum
Sy = symphysis	F_1 = force one
M = marsupial bone	F_2 = force two
F = fin	FR = resultant of forces

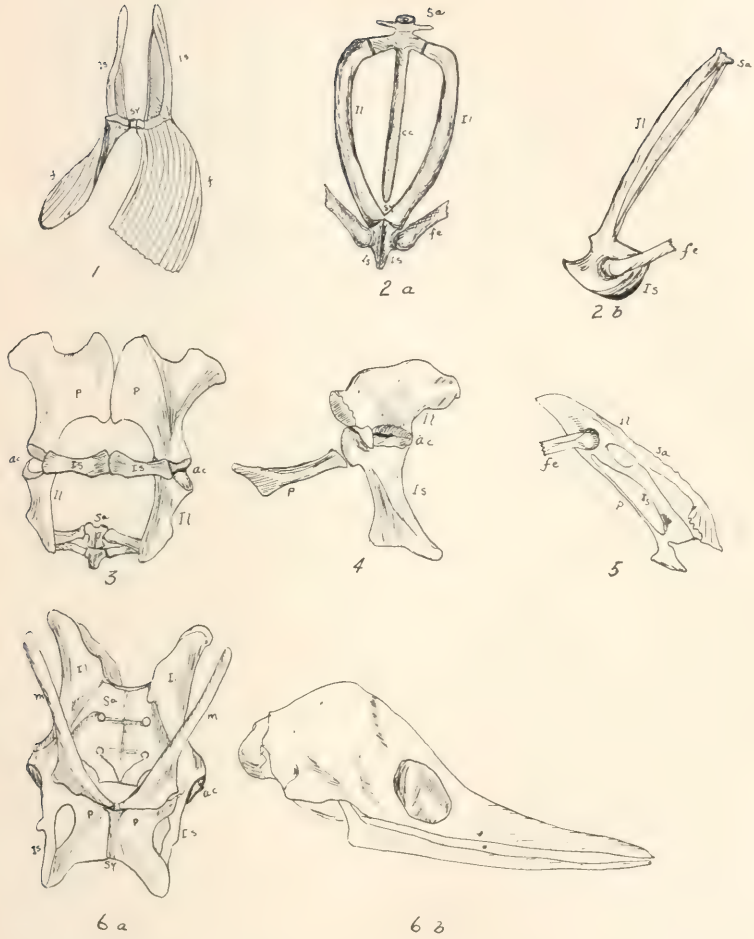


FIG. 1.—Pelvis of the fish. The ischia unite in a symphysis and support the ventral fins.

FIG. 2.—Pelvis of the frog (Rana), *a*, anterior view, *b*, side view. The very long extension of the ilia take the shock of the leap.

FIG. 3.—Pelvis of the turtle. The sacrum and ilia are below, the large pubes above. The bone retains its threefold character.

FIG. 4.—Pelvis of the crocodile.

FIG. 5.—Fused pelvis of the bird.

FIG. 6.—Pelvis and skull of the echidna. *a*, pelvis, *b*, skull.

PLATE II.

FIG. 7.—Pelvis and skull of marsupial (Kangaroo, Macropus ruber), *a*, anterior view of pelvis, *b*, side view, *c*, outlet from behind, *d*, skull.

FIG. 8.—Pelvis and skull of a rodent (Cotia), *a*, anterior view, *b*, side view, *c*, skull.

FIG. 9.—Pelvis and skull of a rodent (Porcupine), *a*, anterior view, *b*, skull.

FIG. 10.—Pelvis of an armadillo (Dasypus 6 cinctus), anterior view. Note the fused, Avian character of the pelvis.

FIG. 11.—Pelvis of the guinea-pig, *a*, normal, *b*, during parturition, showing enormous stretching of symphysial ligaments. (Modified from Owens.)

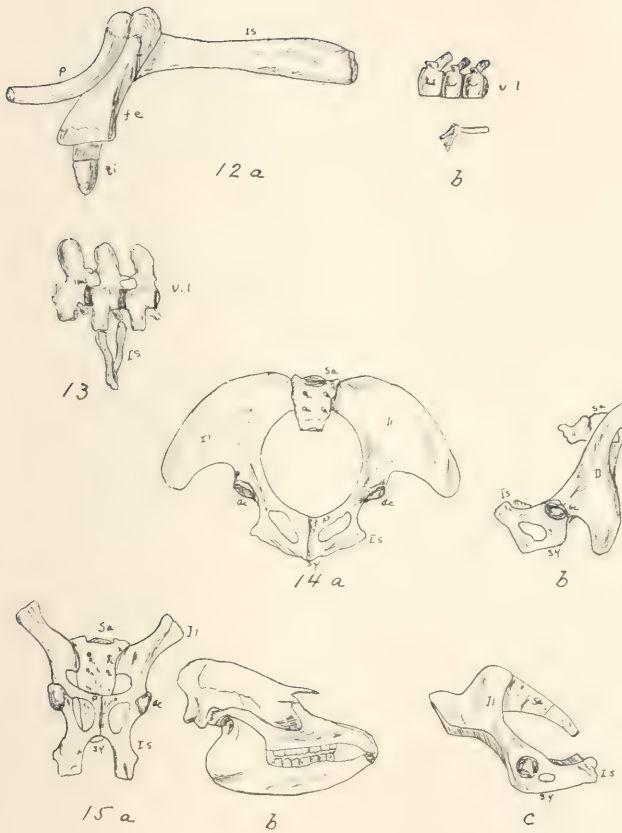


FIG. 12.—Pelvis of the whale (Balena mysticus), *a*, side view, *b*, view *in situ*, showing relation to vertebral column.

FIG. 13.—Pelvis of the dugong. Order Sirenia.

FIG. 14.—Pelvis of the elephant, *a*, anterior view, *b*, side view.

FIG. 15.—Pelvis and skull of the tapir (Tapirus americanus), *a*, anterior view, *b*, skull, *c*, side view.

PLATE IV.

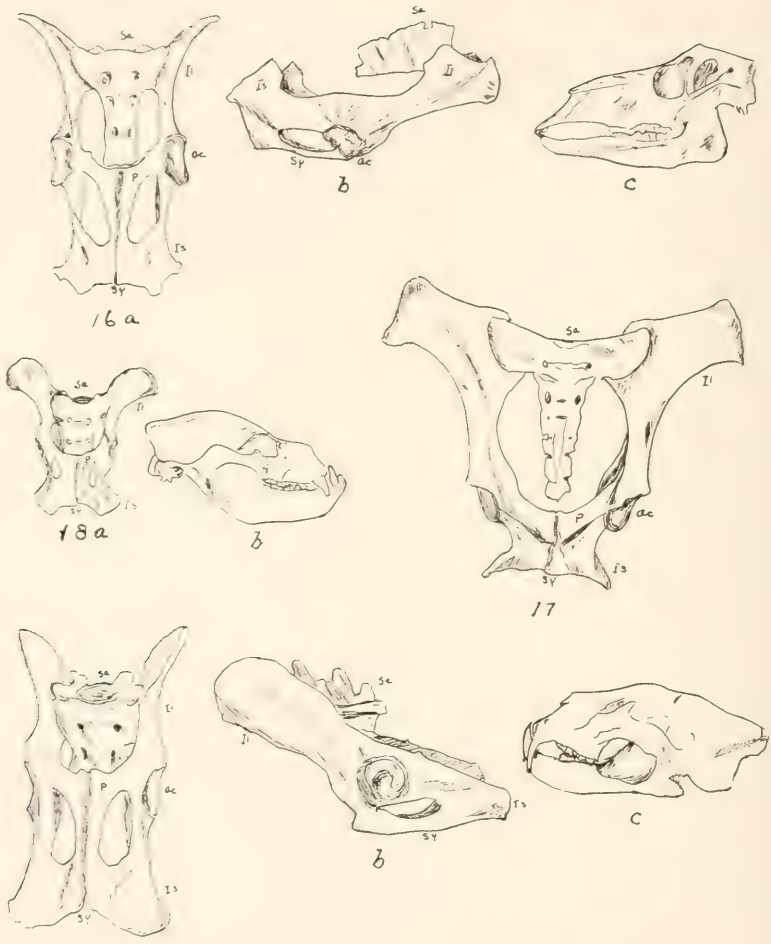
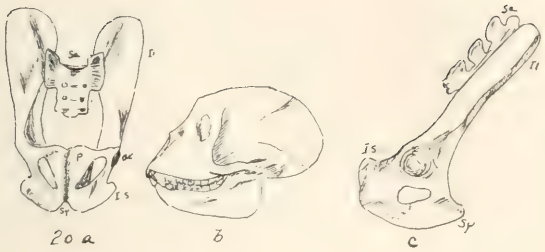


FIG. 16.—Pelvis and skull of a deer (Rusa unicolor), *a*, anterior view, *b*, side view, *c*, skull.

FIG. 17.—Pelvis of a zebra, anterior view.

FIG. 18.—Pelvis and skull of a bear (Ursus labiatus), showing relatively small pelvis as compared with adult skull.

FIG. 19.—Pelvis and skull of a lioness (Felis leo), *a*, anterior view, *b*, side view, *c*, skull.



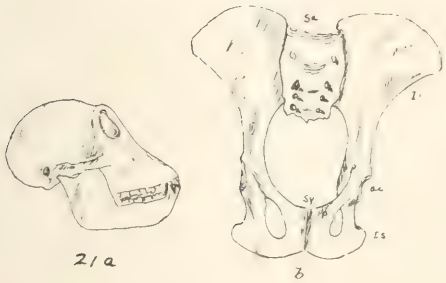


FIG. 20.—Pelvis and skull of a monkey (Macacus), *a*, anterior view, *b*, skull, *c*, side view. Note changes in pelvic architecture and increase in facial angle.

FIG. 21.—Pelvis and skull of chimpanzee (Troglodytes niger).

FIG. 22.—Skull and pelvis of gorilla (Gorilla gorilla). Note approximation to human type.

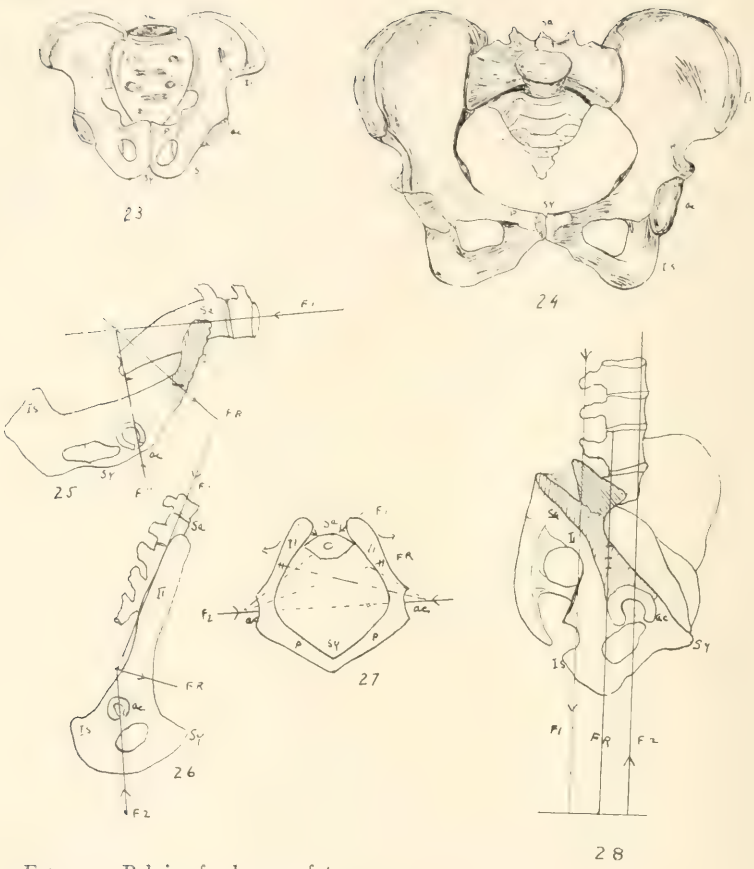


Fig. 23.—Pelvis of a human fetus.

Fig. 24.—Adult female human pelvis.

Fig. 25.—Forces acting upon a quadruped pelvis. F_1, force along vertebral column and sacrum. F_2, the opposing pressure of the femora upon the pelvis. FR, the resultant of the two forces acting on the long body of the ilium.

Fig. 26.—The forces acting upon the monkey pelvis. F_1, the push downward and backward upon the sacrum. F_2, the opposing thrust of the femora, FR, the resultant force acting to twist the body of the ilium outward and forward.

Fig. 27.—A diagrammatic section through the human pelvis at the sacroiliac articulation. F_1, the force exerted by the posterior sacroiliac ligament, pulling the posterior margins of the ilia together and forcing the acetabular ends apart, the sacrum acting as a fulcrum. F_2, the force exerted by the push of the femora inward. FR, the resultant of the two forces acting on the weakest portion of the iliac body and tending to curve it outward.

Fig. 28.—Longitudinal section through the sacroiliac articulation. (Modified from Owens.) F_1, the weight of the body pushing downward. F_2, the upward thrust of the femora. FR, the resultant of the forces, tending to bend the ilia upward and forward at their weakest portions.

As the mammalia grew in intellect and evolution progressed, the tendency to abandon the horizontal position became more and more marked until the erect posture was attained by man.

The condition of the pelvic dynamics during the transition stage is well illustrated by the higher monkeys. In these animals the habitual carriage of the body is one of about 60 degrees inclination of the vertebral column with the horizon, and in consequence there is distinct change in the action of the forces involved.

The weight of the body presses the sacrum backward and downward, tending to force the ilia apart and to widen the pelvis. This force is opposed by the upward thrust of the femora, which, when the animal is standing, lie at an angle of about 30 degrees to the long axis of the pelvis. The displacement of the sacrum downward is resisted by the strong posterior sacro-iliac ligaments which are attached to the posterior surface of the body of the ilium. The resultant action of all of these forces is to press the acetabula forward of their usual position in quadrupeds by the bending strain upon the bodies of the ilia caused by the pressure of the femora upward and forward, and the push of the sacrum downward and backward (Fig. 26).

These same forces next tend to twist the alæ of the ilia outward on their bodies, which are still very long, so that the anterior portion of the alæ are spread outward, the posterior portion being firmly held by the sacro-iliac ligaments.

The pubes and the ischia, being pushed upward with the acetabula, form a sharp angle with the bodies of the ilia, this reaching a right angle in many monkeys. The symphysis being pushed upward is shortened and the angle of the true conjugate decreased.

The result of these changes in the contour of the pelvis upon its function as a parturient tract are at once apparent. The birth canal is growing shorter and the sacrosymphysial

angle less, consequently the canal is developing into a bony circuit having its whole inlet in the same plane, through which the fetal head must pass. No longer is the head well beyond any obstruction caused by the promontory before the symphysis is reached, but both walls of the pelvis are reached at the same time.

The lateral walls of the pelvis are still nearly parallel to each other, though some concavity develops and internal rotation is not yet necessary to bring about molding of the fetal head into its birth passage.

The shortening of the symphysis and the effort of a force acting in line with its articular surface as does the pressure upward of the femora in monkeys, tends to cause that side of the joint to which this pressure is applied to slide upward along its fellow of the opposite side, the symphysis giving way. Such mishap is resisted by the densty of the ligaments composing the sacro-iliac joint which hold the ilia firmly against the sacrum and take the strain off the symphysis. It follows that the former articulation must be a powerful one and incapable of motion to any appreciable degree.

With the attainment of the erect position in man, the mechanics of the pelvis were entirely altered, many new problems presenting themselves and requiring modifications of architecture to make the continuance of the upright position practicable.

The weight of the body, which in quadrupeds is distributed between two planes separated by the entire length of the trunk, *i. e.*, the fore and hind limbs, is in bipeds carried on one plane and supported at but two points. The increased strain is great when the animal is not moving, but when the shocks of motion are superadded the increase in strain is enormous.

In man the pelvis must directly support the entire weight of the body, the strain falling upon the sacro-iliac articulation, the substance of the iliac bodies, and the bony masses

about the acetabula. In addition the pelvis must be firm enough to offer rigid attachment to the powerful muscles which hold the trunk erect.

Further, the weight of the abdominal viscera falling into its cavity, necessitates a tense retaining tissue to be fastened around the whole circumference of the pelvis, the tissues composing the abdominal walls.

As a result of these requirements, the forces involved both in the statics and the dynamics of the human pelvis are complex and interwoven with each other.

The ilia may be considered as long bones, strengthened by the wide buttresses formed by the expanded alæ. They lie obliquely to the body axis, pointing downward, forward, and outward, and are subjected to opposing forces acting in different directions upon their two ends, the middle portion of the bone resting on the raised middle portion of the articular facet of the sacrum, as upon a fulcrum. The forces acting, not in the direction of the axes of the ilia but diagonally to it, throw the greatest possible strain upon these bones.

The sacro-iliac articulation presents many powerful ligaments to hold its component structures in apposition, the ones of greatest importance in determining the contour of the pelvis being the superior or posterior sacro-iliac ligaments, which pass upward and outward from the posterior rough portion of the lateral articulating surface of the sacrum, to the corresponding portions of the ilia, between their articular surfaces and the posterior processes. With this conception of certain details of the construction of the human pelvis, the forces to which it is subjected may be considered.

The chief forces present are two in number, acting in direct opposition to one another and usually in equilibrium: first, the weight of the body transmitted vertically downward to the sacrum and through it to the ilia by the pos-

terior sacro-iliac ligaments, just described; and second, the counter-force exerted by the pressure upward and inward of the femora upon the acetabulum and the bony masses surrounding it.

If the action of the downward force be analyzed, it will be seen that as the sacrum tends to move downward and to rotate forward in the direction of the spinal column (as evidenced by the line of the lumbo-sacral axis) a strong pull is exerted upon these posterior sacro-iliac ligaments, which, being attached to the posterior edge of the alæ of the ilia, tend to draw the alæ inward, on the articular facet of the sacrum as a fulcrum, and, in consequence to throw outward the acetabular end of these bones. If this force were unresisted the pelvis would increase enormously in width, at the expense of the antero-posterior diameter, for the pressure exerted by the body weight far exceeds any tensile strength that might be developed in the tie beams of the pelvis, the symphysis pubis and the rami of the pubes and the ischia.

But this force is resisted by one of equal power and directed upward and inward to counteract the pressure downward and outward.

The scond force is that applied by the femora upon the region about the acetabulum. The upward direction is derived from the necessity for keeping the body erect, the inward direction arising from the pull of the great muscles which swing the leg inward and which hold the head of the femur so closely within the cotyloid cavity. The resultant of this upward and inward force may be seen in the direction of the neck of the femur and is directly opposite to that exerted upon the sacrum (Fig. 27).

It must be remembered that in the adult and completely ossified pelvis, even these forces could not produce marked changes in the contour of the structure, but, acting as they do upon the growing bones, at a time when the three segments of the ossa innominata are still separated by fibro-

cartilage and the entire osseous tissue is to a certain extent plastic, well-defined changes do occur.

If the action of the forces upon the developing pelvis be summed up, it becomes apparent that the ilia are dragged together at their posterior extremities and pushed apart at their acetabular ends. This separation is resisted by the push upward and inward of the femora and, as a resultant of these two forces, the beams of the ilia curve in a segment of a circle at their thinnest and weakest portions, about midway between the acetabula and the sacro-iliac articulation, This bending of the ilia and the thrusting outward of their cotyloid extremities take place more readily in females than in males by reason of the more fragile bony construction, an important factor in the determination of the characteristic changes noted in the female pelvis.

By the bending of the ilia the symphysis is drawn posteriorly closer to the sacrum and the interpubic angle (that included between the long axes of the pubes) is decreased.

The pelvic cavity thus becomes considerably widened in the transverse diameter, equally narrowed in its anteroposterior diameter, and in form becomes broadly oval, the symphysial (interpubic) angle becoming negligible and the triangular element in the contour being almost obliterated.

It has been stated that the forces operative in the human pelvis are in equilibrium, but this is not absolutely true, since the pressure upon the sacrum does slightly exceed the resistance of the femoral thrust, so that the gradual increase of the transverse diameter at the expense of the anteroposterior one may occur.

Should the sacro-iliac articulation be destroyed from any cause, the pressure of the femur on the corresponding side is not resisted and the iliac beam is forced inward, the obliquely contracted pelvis of Nagele resulting. Should both sides of the joint be destroyed, the pelvis of Robert is an inevitable result. (Duncan.)

The chief differences between the infantile and the adult pelvis are such as result from these actions and reactions of powerful forces constantly exerted in greater or less measure.

Thus in the infant the anteroposterior diameter is greater than the transverse; the symphysis pubis forms an acute angle, making the cavity of the pelvis triangular in outline; the ilia are flat bones nearly straight from their alæ to their acetabular ends, and the ililo-ischiatic angle is very small, the bones being almost in line.

The infantile pelvis, then, more nearly approximates the quadruped type and is not at all dissimilar to that of the highest apes (Fig. 23).

If it be considered that the changes between the infantile form and that of the adult are produced almost solely by the action of the forces occurring in the maintenance of the upright position, the conclusion is inevitable that these changes in contour are evolutional in origin.

As to the differences between the male and female type of pelvis, this is found in all mammals, in some to a greater extent than in man. While it is due, as has been detailed, to the different character of the bones themselves, the determinant factor is natural selection. Only those females whose pelves accommodated the fetus were able to reproduce themselves successfully, and this type obviously survived. If to this be added the factor of sexual selection, the inherent tendency on the part of the best males to seek as mates those females best qualified to bear young, there is given ample ground upon which to explain this morphological variation.

The ultimate result of the change in forces brought about by the assumption of the upright position is as follows: first, to develop a forward inclination of the sacrum and a concavity in its surface anteriorly; second, to greatly increase the iliopubic and ilio-ischiatic angles; third, to cause the acetabula to move forward of the lumbosacral axis; fourth, to

shorten the bodies of the ilia and to devlop in them a regular curved surface, its concavity facing forward and inward; fifth, to decrease the interpubic angle and accordingly to remove the triangular quality of the pelvic contour; sixth, to increase the transverse diameter at the expense of the antero-posterior, and seventh, to greatly decrease the sacrosymphysial angle, with the result that the entire pelvic cavity lies in one plane (Fig. 28).

The effects of forces in alterations of the pelvic architecture may be seen in their several stages by the observation of the mammalian pelvis in the course of its evolution and development. The transitions in form are very gradual-but their gradations are well shown in the characteristic forms which have been described; the quadruped, monkey, anthropoid ape, human fetal, and adult human type.

It is not within the province of this study to consider in detail the deformities of the pelvis, but it is readily apparent that the great majority of such deformities are developmental in their nature and are due either to an excess of one of the active forces or to a deficiency in the passive resistance of the bones and joints.

The occurrence of the Nagele and Robert pelves have been described as due to destruction of one or both sacro-iliac joints, thus preventing the outward rotation of the ilia to oppose the pressure of the femora. In like manner the rachitic and osteomalacic pelves are caused by deficiency in the osseous tissue which permits the pressure inward and upward of the femora to bend the growing bones inward, even though the sacro-iliac articulation throws the acetabular ends outward in a normal manner.

The individual varieties of pelvic deformity might all be analyzed in the same manner and their origin be found in some fault in the pelvic mechanics.

Besides the assumption of the erect position, it has been stated as a portion of this thesis that the enormous increase

in intellect with its correspondingly great frontal development of the cranium and the growth backward of the occipital lobes has had a marked effect upon the mechanism and the difficulties attending parturition in the human species.

The presenting fetal part in any animal must be conical in form in order to obtain the best mechanical advantages for egress from a resisting passage, and in the lower mammalian orders, from the monotremata to the quadrumana, the facial angle is so low that the conical form of the cephalic presentation is best maintained by extension of the fetal head, the pointed snout in advance. The absence of a marked posterior cerebral lobe permits the posterior portion of the skull to merge into the neck, when in extension without any marked prominence of the occiput. The resulting long wedge then passes with ease through the parallel-sided outlet and along the trough formed by the long symphysis. (See figures of skulls accompanying pelves.)

When in the higher monkeys, the anthropoid apes, and man the facial angle rises above 45 degrees and the occipital lobes cause a development backward of the vault of the cranium, the extended head does not present as a cone but as an irregular surface with the three several obstructive points of the chin, the forehead, and the arched occiput.

In these animals the head is extruded in extreme flexion, the occiput presenting, the chin sunk into the root of the neck, and the forehead offering no obstacle to the passage but lying in the long axis of the fetus. Furthermore, owing to the bony cavity of the human pelvis lying in one plane, and in consequence of the posterior part of this cavity being occupied by the maternal soft tissues, it becomes necessary to rotate the fetal head from an oblique to an anteroposterior position in order to facilitate egress. This is the mechanism of internal rotation which, as has been stated, is at best a compromise on the part of nature to balance the

changed pelvic contour and the enlarged cranium, with the mechanical processes of parturition.

In the light of the facts herein presented, it seems a reasonable and just conclusion that the mechanical difficulties which occur during parturition in the human female may be entirely explained by a consideration of the method of development of the human pelvis, and that the present form and type of that pelvis is a direct result of the alterations brought about by the very gradual evolution of man from his immediate and remote vertebrate ancestors.

THE PATHOLOGY AND TREATMENT OF CHRONIC LEUCORRHEA

A STUDY OF THE CAUSES OF PURULENT VAGINAL DISCHARGES AND THE RESULTS OF VARIOUS KINDS OF TREATMENT

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The study of chronic leucorrhea was undertaken chiefly because so much concerning the subject has remained a mystery. In the two years devoted to the work a liberal amount of dispensary material, added to unusual opportunities for the study of private patients, has made it possible to follow a considerable number of cases. Eighty-five of these have been subjected to thorough bacteriological study.

Types of Patients in Which Purulent Discharges Occur. The vast majority of cases of chronic purulent vaginal discharge in women who have not been pregnant are consequent to gonococcal infection. Such, at least, is the evidence from observation of dispensary and private patients made with the special object of determining this point. In virgins and other nullipara whose history and local findings exclude suspicion of specific infection, discharges other than those of a mucous nature are not usual; when found in these cases free from venereal disease, mucus secretion is usually associated.

In women who have borne children additional factors which appear to lead to purulent leucorrhea are infections associated with pregnancy, altered anatomical relationships

consequent to labor, loss of elasticity of tissues, and increased mucus. (A consideration of cancer is scarcely within the scope of this paper and is purposely omitted.)

Place of Formation of Discharges. To decide whether uterine infection exists in cases with chronic discharge, the cervix has been regularly exposed to view and observed; it has also often been dilated to assure free drainage during the period of observation. Cultures were made from the uterus obtained at operation in several instances, and likewise from scrapings from a dozen patients with leucorrhea. The net results have been a failure of almost all attempts to discover a purulent discharge from the uterus, and negative findings in the smears and cultures. It therefore appears that purulent discharges are formed in the lower genital tract and rarely consists of bacteria-laden material from the uterine cavity. It must at the same time be remembered, however, that mucus comes from the cervix and that this mucus may form culture material for vaginal bacteria.

Bacteriology of Leucorrhea. The results of a study of the bacteriology of leucorrhea have been reported[1] as a preliminary to the present contribution. A consideration of findings as there recorded and of recent results obtained is desirable before entering upon a discussion of treatment.

Secretions from the uncontaminated vagina, *i. e.*, secretions from children and from women who have not had intercourse, also those from a surprisingly large number of married women, contain almost exclusively the large Gram-positive vaginal bacilli of Döderlein (Figs. 1 and 2). The other extreme is represented by the bacteria found in profuse leucorrheal discharges. In an intermediate group belong the secretions from most married women; these present a gradation from normal to leucorrheal bacterial content,

[1] On the Etiology and Bacteriology of Leucorrhea, Surg., Gyn., and Obst., 1914, xviii.

the organisms present in each instance depending upon the amount and character of the vaginal flow.

I have succeeded in isolating and determining the cultural characteristics of a considerable number of bacteria common to leucorrhea, some of which are here shown (Figs. 3, 4, 5, 6, 7, and 8). Many of these are already well known. Others, notably anaërobes, have not been previously described. A detailed discussion of most of these various organisms is included in the former report.

Characteristic of smears and cultures from leucorrheal discharges is the preponderance of anaërobic bacilli. Cultures from the external genitalis in contrast with higher vaginal cultures contain more aërobes, notably B. coli, staphylococci, and pseudodiphtheria bacilli. Consequently, high vaginal cultures from patients who are subjected to frequent douching show contamination with these bacteria, but in true vaginal cultures certain types of anaërobic bacilli are predominant.

Gram-positive diplococci are always present in vaginal smears. Often they are in considerable numbers, but are not found in groups or chains. Streptococci are infrequent in fresh preparations, but readily develop from diplococci on artificial media (Fig. 3). Staphylococci are found in the vaginal smears, but are notable chiefly for their moderate number. It is also doubtful whether bacilli of the colon group actively participate in the production of leucorrhea. The part played by pseudodiphtheria bacilli requires further study.

Gonococcus. In smears made from vaginal pus the gonococcus resists positive identification. It can be differentiated from other forms only if found in considerable numbers and in typical arrangement. From its favorite locations, however, it is obtained frequently enough to reveal its enormous importance as the primary cause of subsequent chronic leucorrhea. After creating conditions favorable for the

development of other organisms which are associated with chronic purulent discharge, in a considerable percentage of cases the gonococcus disappears, or at least is not demonstrable through any means at our command. This suggests that a chief part played by the gonococcus in chronic leucorrhea consists in preparing the soil for the leukorrhea-producing anaërobic bacteria.

TREATMENT. *Introductory.* As preliminary to the subject of treatment, some features of importance in the foregoing may be summarized for sake of emphasis:

1. The uterine cavity tends to remain free from bacteria in cases of leucorrheal infection.

2. Excessive mucus secreted from the cervix not only increases the total amount of vaginal discharge, but at the same time is culture material for bacteria which produce purulent discharges.

3. The usual seat of formation of purulent discharges is the lower genital tract (lower cervix, vagina, and vulva).

4. In the vast majority of cases the picture is one of decreased local vitality, with associated low-grade infection. The organisms present are chiefly anaërobes, notably anaërobic bacilli. Often aided by increased mucous secretion, these apparently midly virulent bacteria lodge and develop. There is reason to believe that they play an active part in the production and maintenance of leucorrhea, until through treatment or increased local resistance their further growth is prevented.

Indications for Treatment. Indications formulated from a study of the causes and of the bacteriology of leucorrhea, aided by experience with treatment of various kinds, are as follows:

1. Improvement of the lowered resistance of the genitalia.

2. Avoidance of treatment which is not indicated and which may do harm.

3. Arrest of excessive mucous secretion from the cervix.

4. Treatment directed against residual gonococci or lesions resultant from gonorrhea.

5. Employment of special curative measures, *i. e.*, vaccines, powder treatment, etc.

Improvement of Lowered Resistance of the Genitalia. Assuming we have to do with a loss of local balance, with vitality not sufficient to cope with weakly pathogenic bacteria, detailed attention to causes of lowered resistance is indicated. Systemic disorders require watchfulness, the bowels must be free; complicating displacements, tumors, pus tubes, and the like, must be cared for.

Lacerations incident to childbirth are particularly objectionable; gaping of the vulva invites contamination, congestion of torn tissues promotes the transudation of serum in which bacteria may develop, and in folds of relaxed mucous membrane secretions accumulate and form pockets of purulent material. These lesions may be of such a character that a plastic operation is needed before recovery can occur.

Avoidance of Treatment Which is Not Indicated. *Treatment of the Uterine Cavity.* Granted that the uterus is commonly free from bacteria, as seems true from my experience, treatment of the uterine cavity is not indicated. If infection of the endometrium does exist, harrowing the soil through use of the curette may tend to increase rather than diminish infection; in such cases we would oppose anything more than dilatation for drainage, possibly aided by iodin or other topical applications.

Douches. The use of douches appears to be ill-devised. Just as irrigation of the peritoneal cavity, and of other infected surfaces has been found to be irrational, so douches scatter bacteria broadcast and fail to thoroughly remove the source of infection. In my experience douches have yielded poor results.

Tampons. These require only passing mention, as they have been quite generally discontinued. There seems little

more indication for vaginal tampons than for the use of glycerin-ichthyol soaked cotton packing in deep wounds of the body surface.

Excessive Mucous Secretion from the Cervix. Mucus plays a big role in leucorrhea production; when it is present in excess the cervix requires attention. Operation with excision of excessive glandular tissue would be the method of choice did it not require anesthesia. Scarification, advocated by Hunner, may be employed. The use of powder will be mentioned later. Repeated cauterization with 20 per cent. silver nitrate destroys mucous glands, gradually enlarges the cervical canal and is excellent for destruction of deep-lying gonococci; this has been employed in a number of extreme cases with gratifying results.

Treatment Directed Against Residual Gonococci or Special Tissue Changes Resultant from Gonorrhea. Deeply buried infection of the urethra and granulations of the urethra react favorably to applications of silver nitrate. Long-standing infection of Skene's ducts or of the periurethral glands may be treated by cauterization with 20 per cent. silver nitrate; recourse to excision may be had as a last resort. Chronically infected Bartholinian glands require removal. Treatment of the cervix is similar to that for excessive mucus secretion.

Vaccine Therapy. The views of many leaders in medical thought are at variance concerning the value of vaccine therapy even in infections with a single organism. This is an indication of the difficulties met with in formulating conclusions concerning the value of vaccines when many bacteria are present. To avoid bias in favor of bacterial therapy from results in cases which might have recovered spontaneously, vaccines have been used only in long-standing cases with free discharge.

Variety of Vaccines Used. Fresh smears are examined to ascertain whether any organism is predominant. Such

being the case, that organism has been selected. Unusual forms, when prevalent, have likewise been grown for vaccine. Because streptococci are known to play an essential part in infectious processes these have been employed for vaccines when streptococcus colonies have been numerous in cultures.

Anaërobic cultures yield an elevated, roughly beaded, rich growth, whereas control aërobic cultures commonly develop poorly in comparison. Large numbers of anaërobic tubes have been inoculated directly from the patient, the series opened at the time of well-developed growth, and those selected for vaccine which most nearly correspond with the vaginal flora as seen in fresh discharge. The slow development of many anaërobes suggested the advisability of use of mature cultures as well as of younger growths; vaccines have, therefore, also been made from growths three or more days old.

Sometimes from one or two original anaerobic cultures a set of subcultures have been made for vaccines. With this subculture method there is a tendency to overgrowth of types originally not numerous, with disappearance of many bacteria which are abundant in vaginal smears. Hence, there is objection to this technique.

Administration of Vaccines. Despite the low virulence of these bacteria, demonstrated by injection of animals with fresh discharges and with cultures, it has been deemed best to begin with moderate doses. An initial injection of 10,000,000 or 20,000,000 is succeeded every second or third day by rapidly increased doses, until 150,000,000 to 200,000,000 are given at one time. Thereafter treatment occurs every fourth to sixth day, with the amount increased or diminished as indicated.

Results. Many patients apparently cured suffer from recurrence at a later date. An instance of this is shown by a patient who for six years had undergone, without improvement, every known treatment for a very profuse creamy

FIG. 1.—Döderlein bacilli in smears from normal vagina. A usual picture in smears from non-infected, multiparous women.

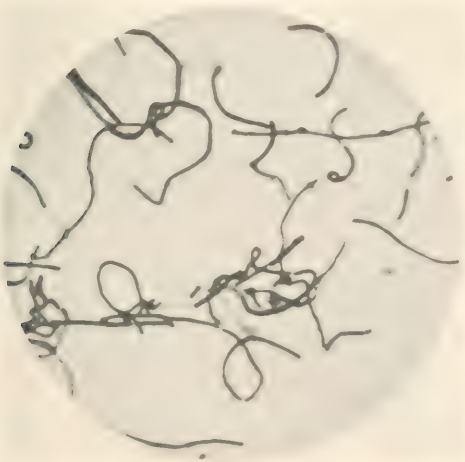

FIG. 2.—Pure culture of Döderlein bacilli. Gram stain. Increase in length and formation of short chains is usual in culture. Growth is poor except on sugar-containing media.

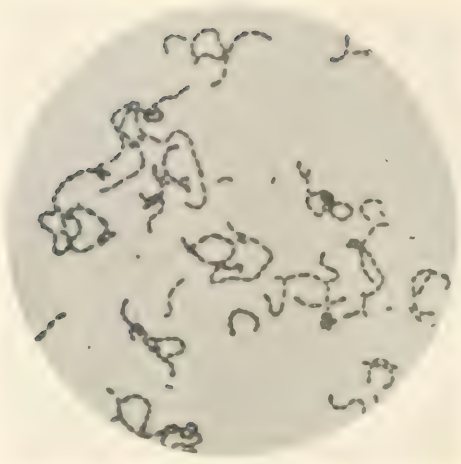

Fig. 3.—Anaërobic streptococcus. Gram stain. Almost never seen in first discharges. Developed from diplococci in culture in 30 per cent. of cases.

Fig. 4.—Bacillus funduliformis in pure culture. A pleomorphous anaërobic bacillus often present in leucorrheal discharges.

Fig. 5.—Anaërobic, curved, flagellated bacillus which moves with peculiar cork-screw motion. Many times found in large numbers in postabortive leucorrheal cases. ×1000.

Fig. 6.—Anaërobic, curved, flagellated bacillus (see Fig. 5). Zettnow's silver nitrate flagella stain. ×1200.

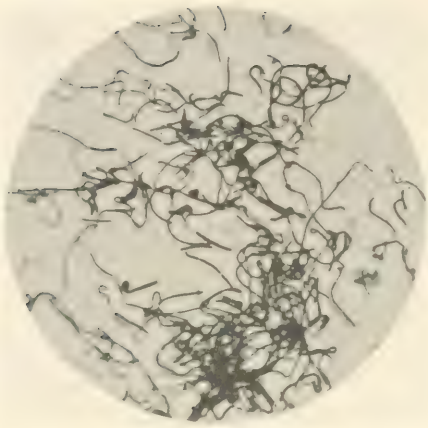

FIG. 7.—Cultures of bacillus of lactic acid group in symbiosis with a Gram-negative fusiform bacillus. Used for vaccine with good result. Carbo-gentian-violet. ×650.

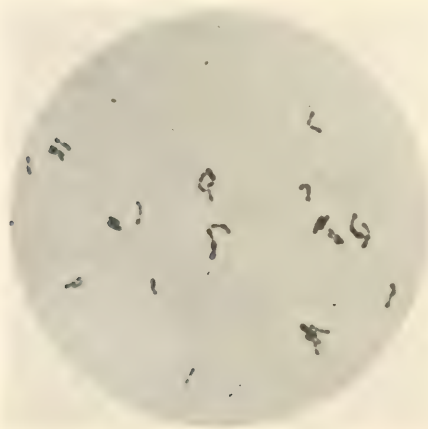

FIG. 8.—Bacillus of diphtheria family. This type is often isolated from leucorrheal discharges.

discharge. A course of vaccines resulted in complete cessation of leucorrheal flow. Treatments were discontinued and conditions remained satisfactory for two months. Discharge then slowly returned and became gradually more profuse despite renewed use of vaccines, which thereafter were without favorable influence.

A considerable number have shown decided decrease in discharge while under treatment without attainment of the point of absolute cure. With cessation of treatment such patients tend to gradually return to their original condition; a few are permanently improved.

A fair percentage of patients are cured. A statement of the number of cures thus far obtained is omitted because experience leads us to believe that our present statistics indicate more favorable results than we will be able to secure with a larger series of cases.

A most encouraging feature has been the relief of backache and general malaise. Backache, which is a most frequent symptom, when not attributable to other causes is greatly relieved through vaccine treatment. The temporary increase in distress after rather large injections, also the return of backache sometimes with cessation of vaccines, indicates an intimate causal relationship between discharge and backache, and allays the suspicion that cure is attributable to psychic influence.

Vaccines prepared from selected anaërobic cultures have had the most favorable influence upon discharges. Anaërobic streptococcus vaccination was followed by disappearance of diplococci in only one case. Staphylococci caused no improvement. An autogenous vaccine prepared from a bacillus of the lactic acid group combined with a Gram-negative fusiform bacillus (Fig. 7) helped one case. Other isolated strains produced no noteworthy results.

As an aid to vaccines dry cleansing of the vagina and vulva has been used considerably. Some most refractory

cases have been swabbed with iodin and treated with suppositories containing various remedial agents.

Powder Treatment. Powder treatment of various kinds, employed by Abraham, Albert, Kehrer, Liepmann, Nassauer, and many others with reputed excellent results, has been given a thorough trial. That no essential detail might be overlooked, freshly prepared packages were secured direct from the manufacturers who supply the advocates of this method. Patients have been most punctual in appearing for treatment and applications have been made with especial care.

At the time of treatment the cervix and vagina have been exposed and carefully dry cleaned. Enough powder to form a thorough yet thin coating (one dram or more) has then been introduced and painstakingly applied throughout. Early cases were given a douche at the end of twenty-four hours, but it has been found more satisfactory to remove the powder through dry cleaning. Treatment is ordinarily given every day for a few days, then every second day, and thereafter at still less frequent intervals. Variations in the method of procedure are required according to the needs of individual cases.

Temporary improvement has been the rule. During the course of treatment irritation and inflammation have disappeared, secretion has been absorbed by the powder, the patients have felt well. Erosions heal with the cessation of vaginal secretion and thereby mucus is decreased.

Yet despite the favorable outlook, even with treatment extended beyond the prescribed period, there is a tendency to recurrence. Acute cases are started on the high-road to recovery. Through temporary relief from irritation even some that are chronic go on to cure, but a great proportion slip back into their original condition. This is true despite the addition of yeast, silver nitrate, peroxide or other ingredients.

DEDUCTIONS. 1 Care of the general health, free elimination, and treatment of pelvic complications which predispose to mild local infection must not be overlooked in the care of chronic leucorrhea.

2. Bacteriological examinations indicate that treatment of the endometrium can ordinarily be dispensed with. In unusual cases dilatation for drainage, possibly aided by topical applications, is logical treatment.

3. Curettement of the uterine cavity, douches, and tampons are probably harmful.

4. Glands of the cervix which produce excessive mucus secretion should be excised, destroyed by cautery, or otherwise rendered inactive.

5. Purulent discharges originate as a rule in the lower genital tract. Bacteria of low pathogenicity, chiefly anaërobes, evidently play an active part in their production.

Autogenous vaccines decrease general malaise and backache. When aided by correction of associated pathology their influence upon chronic purulent discharges is beneficial; a large number of patients are helped only so long as vaccines continue to be administered, a smaller number are permanently improved, and a fair percentage appear to be cured.

6. Powder treatment exerts a favorable influence but in our experience has a limited value only. Yeast seems not to have a distinct advantage over other forms of powder treatment. The medicinal effects of ingredients of the powder are probably secondary to benefits from its absorptive action. Irritating discharges are absorbed by the powder, whereby the tissues are given opportunity to regain their normal resistance. If the tissues are incapable of return to normal while kept dry through use of powder, recurrence of discharge may be expected with discontinuance of treatment.

7. Specific treatment that produces for us the highest

percentage of successful results consists in the continued use of autogenous vaccines and dry cleansing of the vagina, together with applications of powder. Local treatments with iodin or other drugs are possible sources of help.

In the future good may come through *x*-rays, radium or specific drug therapy. There will doubtless always remain uncured a considerable percentage of cases in which systemic disturbances or local lack of resistance are so pronounced that no form of treatment can overcome the local infection and discharge.

Many thanks are due Dr. Thomas J. Watkins for material furnished and for constant and helpful interest shown throughout the course of this work.

THE INVOLUTION OF THE UTERUS AND ITS EFFECT UPON THE NITROGEN OUTPUT OF THE URINE

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Some years ago I had the opportunity to study the nitrogenous metabolism of pregnant women who had been placed upon a constant diet containing about the same amount of nitrogen and possessing the same calorific value as that the average woman would select. Similar observations were made during labor and continued for three weeks in the puerperium. The total nitrogen curve of the urine, thus obtained, presented three main features: During the latter part of pregnancy it was lower than in non-pregnant women; at the time of labor it fell even below the level of pregnancy; while during the puerperium it rose to such an extent as to become greater than that generally accepted as normal. This relatively high excretion persisted for about two weeks.

At the time my results were published their explanation could be only a matter of conjecture. The retention of nitrogen during pregnancy, it seemed, must be in the interest of the fetus, as it was needed to assist in its growth, as well as to promote the development of the uterus, the placenta, the breasts, and other organs which function more actively during or just after pregnancy. The nutritional requirements of the maternal organs which subserve the welfare of the fetus are not inconsiderable, and Lands-

berg estimates that the amount of nitrogen retained during pregnancy is four times greater than is necessary for fetal growth alone. These factors in the retention of nitrogen during pregnancy have been accepted by all who have investigated the subject, notably by Zacherjewsky, Schrader, Sillevis, Hahl, Bar, Murlin and Bailey, Hoffström, and Seitz, but as yet no one has discovered the mechanism by which such a retention is effected.

The low urinary excretion at the time of labor also remains unexplained. It may result from a disturbance in the renal circulation, for which the uterine contractions are primarily responsible, or from the effect upon the kidneys of some as yet unknown metabolic product, which simultaneously stimulates the uterus to contract, and in all probability is due to a combination of these factors.

The increase in the excretion of nitrogen through the urine, which is regularly observed after labor, has given rise to a good deal of speculation, and several hypothetical explanations have been advanced concerning it. Grammatikati thought that it was due to lactation and based his belief upon the theory that the fat in the milk was formed from protein. In this event the nitrogenous residue became a waste-product, and its elimination through the kidneys would account for the large increase in the amount of nitrogen in the mother's urine. While it is impossible to prove that this theory of the formation of milk-fat is incorrect, no evidence has been adduced to show that lactation is responsible for the large nitrogenous excretion through the urine of puerperal women. On the contrary, all the evidence is against it, as the phenomenon appears even though the woman does not suckle her baby. Furthermore, even when lactation continues undisturbed, the nitrogen output diminishes spontaneously by the end of the second week after labor. Likewise, the suggestion which holds that too sparse a diet is responsible for the phenomenon is equally untenable, as puerperal women who

receive an amount of nourishment quite sufficient for their weight still excrete an unusually large quantity of nitrogen during the first two weeks of the lying-in period.

The correct explanation is very simple. Purely upon clinical grounds it would seem probable that the phenomenon is associated with the involution of the uterus, a process by which the organ is reduced within a few weeks from the size of a newborn baby's head to that of its fist, while its weight becomes diminished from 1000 to 50 or 60 grams. The process is now regarded as due to autolysis, which breaks the muscle-protein down into simpler substances. These pass into the circulation, are eliminated through the kidneys, and thus increase the amount of nitrogen in the urine.

Fortunately, this hypothesis can be tested experimentally, and requires two series of observations. In the first we ascertain whether the increased nitrogenous output observed after normal labor is in any way affected by the performance of Cesarean section, while in the second we determine whether it is influenced by the removal of the uterus at the time Cesarean section is performed. If there is a marked decrease in the amount of nitrogen excreted after the removal of the uterus it would appear justifiable to attribute it to the artificial interference with involution. The opportunity to investigate this problem was given me by Dr. J. Whitridge Williams while I was a member of the staff of the Johns Hopkins Hospital, and the records of the two cases in which the observations were most complete form the basis of this report.

Case I. Conservative Cesarean Section. A. W., negress; II-para; thirty-one years old; generally contracted rachitic pelvis; pregnancy normal; expected date of confinement, February 8.

Labor began February 12 and lasted 46½ hours, when a classical Cesarean section was performed. Ether anesthesia lasted one hour. The puerperium was normal until the

twenty-third day, when a small superficial breast-abscess developed which was promptly incised and healed within a week.

Metabolic observations were begun thirty-two days before delivery. At that time the patient's weight was $119\frac{3}{4}$ pounds and ten days later $122\frac{3}{4}$ pounds. During this period the average daily nitrogenous content of the food was 15.6 grams, of the urine 10.23 grams, of the feces 1.68 grams. The average daily storage of nitrogen was 3.66 grams.

On the day of delivery the fluid intake was 730 c.c. and the urine measured 890 c.c. The nitrogen of the food was 4.38 grams; of the urine 5.04 grams. The patient weighed 110 pounds at the conclusion of the operation.

Liquid nourishment alone was permitted for three days after operation, and the diet used during pregnancy was not again employed until the end of a week. During the first twenty days of the puerperium the average daily nitrogen of the food was 12.88 grams, of the urine 12.15 grams. The additional loss through the milk, lochia, and feces resulted in a negative nitrogen balance, so that the average daily loss of nitrogen was 3.56 grams. At the end of this period the patient weighed 105 pounds.

From the clinical observation of the size of the uterus, as well as from the character of the urinary nitrogen curve, it seemed that the acute involution of the uterus ended about the seventeenth day. Observations, however, were continued until the twenty-first day, when the patient complained of pain in the breast. The temperature was then 100.5°F., and two days later rose to 104.5°F. It fell to normal shortly after the abscess was opened. Although the urine was collected and analyzed during the existence of this complication the results are not included here, for the high nitrogen values obtained were due to the fever and bear no relation to the problem under investigation.

Observations were resumed after the patient had entirely recovered, namely, from the forty-first to the forty-fifth

day postpartum. The diet was then the same as had been employed during pregnancy. The urine nitrogen averaged 10.25 grams per day. During this period the patient was practically in nitrogenous equilibrium. She weighed 107 pounds at the beginning and 107¼ pounds at the end of this, the final series of observations.

Case II. Cesarean Section with Supravaginal Hysterectomy. S. C., negress; I-para; twenty-one years old; generally contracted rachitic pelvis; pregnancy normal; expected date of confinement, July 29.

Labor began July 27, and shortly after its onset a Porro-Cesarean section was performed. Ether anesthesia lasted an hour and a quarter. The puerperium was normal, but the patient was unable to nurse the baby satisfactorily on account of an inadequate supply of milk.

Metabolic observations were made uninterruptedly from the fourteenth day before delivery until the twentieth day postpartum. Since the decision to perform Cesarean section had been reached in advance it was possible to do the operation at the close of one of the twenty-four-hour periods of observation. On this account the data designated the day before delivery actually includes several hours after labor had begun.

At the beginning of the observations the patient weighed 96 pounds and at the onset of labor 99½ pounds. Unusually satisfactory data were obtained during the eleven days of pregnancy, while the patient was taking a mixed diet. At the end of that time observations were desired relating to a liquid diet such as would probably be used for some days after the operation. These were in progress when labor started.

During the last two weeks of pregnancy the average daily nitrogenous content of the food was 15.02 grams, of the urine 8.7 grams, and of the feces 1.8 grams. The average daily storage of nitrogen was 4.52 grams.

Although the diet for two days following the operation

consisted of liquids in restricted amounts, the output of nitrogen through the urine rose immediately and reached its maximum on the third day postpartum. An attempt was made to return to the diet which had been used during pregnancy but the patient was unable to take so much, and was not able to do so until the end of two weeks.

During the puerperium the average daily amount of nitrogen in the food was 12.59 grams, in the urine 9.1 grams, and in the feces 0.95 gram. The patient did not suckle her baby and there was no lochia. The nitrogen balance was negative four days after operation, but subsequently was positive. The average daily retention was 2.45 grams nitrogen. The patient weighed 79½ pounds just after the operation and 83¾ pounds at the conclusion of the postpartum observations.

The body of the uterus removed at the Cesarean section weighed 850 grams and a small portion of the fresh tissue was dried to constant weight, and showed that 70 per cent. moisture was present. Consequently the amount of water-free substance in the entire uterus was 255 grams. Analysis by the Kjeldahl method showed that the uterus contained 38.75 grams of nitrogen.

These observations show in the first place that after Cesarean section the output of urinary nitrogen is high. For example, the excretion in Case I rose on the third day and remained elevated for about two weeks. During this period the involution of the uterus was in progress; it was probably completed on the seventeeth day, certainly not later than the twentieth day. The average daily excretion for this period was 1.9 grams greater than during the post-puerperal period. In other words, about 40 grams of urinary nitrogen excreted during the first twenty days of the puerperium must be accounted for, and this is also the problem presented in the case of women who have been delivered naturally.

With regard to a few minor points the puerperal metab-

olism of this patient did not follow the rule. Thus the increase in the output of nitrogen began somewhat later and continued somewhat longer than usual, and also reached a greater maximum elevation than we are accustomed to see in the normal puerperium. Such deviations, however, may be explained by the influence of the anesthetic and by the fact that the patient was recovering from a laparotomy. The latter influence probably delays involution, as do other puerperal complications, which have been considered in detail by Dittrich, Goodall, and others.

In both Cases I and II the most conspicuous feature of the nitrogen excretion is the sharp rise following the operation, but this feature is not entirely attributable to conditions peculiar to pregnancy or the puerperium. Similar increase in the urinary nitrogen may occur after operations upon women who are not pregnant as well as in men. Moreover, it may occur after the administration of an anesthetic merely for diagnostic purposes.

The effect of chloroform and of ether anesthesia upon the excretion of nitrogen has been studied both clinically and experimentally. Thus, Vidal found after anesthetizing dogs with chloroform that the urine contained two or three times as much nitrogen as normal. Similar experiments by Strassmann revealed an increase of 20 per cent. Drapier, however, whose observations were made upon human beings noted a less marked rise and stated that the increase in the nitrogen immediately after chloroform narcosis might be so slight as to be obscured in the 24-hour urine.

A similar increase in the urinary nitrogen following ether anesthesia has been described by Kappeler, Leppmann, Hawk, and others. The carefully conducted experiments made upon dogs by Hawk show that after ether narcosis the urine presents an increase in nitrogen amounting to from 6.5 to 27.1 per cent. From not altogether sufficient evidence Hawk considers that the duration of anesthesia bears no relation to the amount of nitrogen lost, and believes

that the susceptibility of the individual must account for such differences as he noted. In exceptional instances he found no change in the excretion, but as a rule within forty-eight hours after ether anesthesia the urinary nitrogen rose and remained high for a day or so, occasionally for as long as five or six days.

Observations which I have made upon gynecological patients show that anesthesia has the same effect as was noted in animal experiments. Following operation there is generally, though not invariably, an increase in the urinary nitrogen. Moreover, the phenomenon is independent of the diet, of hemorrhage, and of the absorption of blood from the peritoneal cavity. I am, however, inclined to believe that the duration of anesthesia may be a factor of importance, for the increase is less pronounced when the anesthesia is brief, as in cases of curettage, than in longer operations.

To illustrate the increase which may occur in the urinary nitrogen following an uncomplicated laparotomy it will suffice to give the records of a patient upon whom ventrosuspension of the uterus was performed. The patient took the same amount of nourishment each day except during the day of operation, and her diet of milk, bread, and rice contained 12 grams of nitrogen. The urinary nitrogen, which is represented in Chart II, was notably higher from the second to the fifth days following operation; and this result can be attributed only to the influence of the anesthetic, for the dietary conditions were identical before and after operation and there was practically no loss of blood.

In view of the experimental and clinical evidence here adduced there can be no doubt that the rise in the urinary nitrogen immediately following the Porro-Cesarean section is referable to the influence of anesthesia. In Case I as well there was a similar effect, but the presence of the involuting uterus makes it impossible to estimate exactly the influence of the anesthetic. Certain other facts, however,

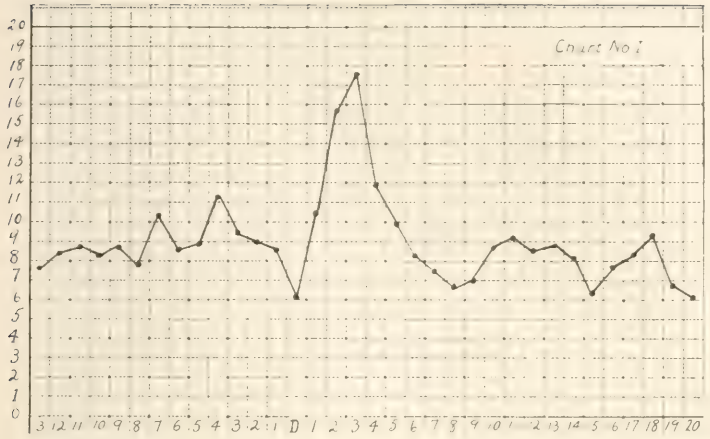

CHART I.—The total nitrogen of the urine during pregnancy and the puerperium in Case II in which Porro-Cesarean section was performed. Figures at the side represent grams of nitrogen, those at the bottom the day before or after delivery. *D* is the day of operation.

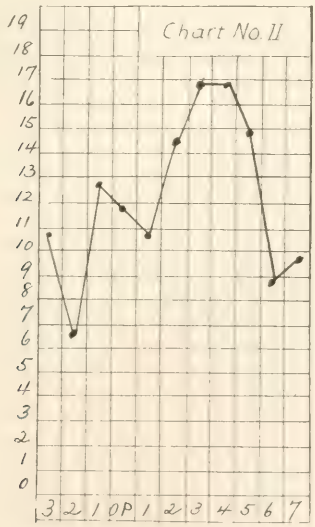

CHART II.—The total nitrogen of the urine before and after suspension of the uterus. Duration of anesthesia one hour. Figures at the side represent grams of nitrogen, those at the bottom the days preceding or following operation.

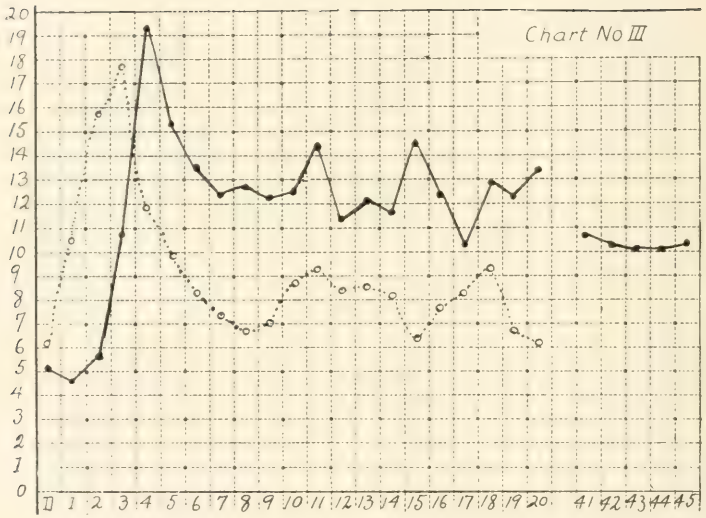

CHART III.—Contrasting the total nitrogen of the urine after conservative Cesarean section and after the Porro operation. Solid line represents the excretion in Case I, in which the uterus was not removed; broken line that of Case II, in which it was removed. Figures at the side and bottom have same significance as in other charts.

are of interest. Thus the effect of anesthesia became evident more promptly in the case from which the uterus had been removed. On the other hand both the maximum daily excretion and the average excretion were greater in the case of conservative section, which must have been due to the fact that the uterus was in process of involution.

In further comparing our cases, however, the effect of anesthesia may be disregarded, since both were subject to its influence. The period chosen as the basis of comparison naturally would be determined by the duration of the involution process in the case in which the uterus was not removed, and in order to be sure that the records covered this period, observations were continued for the first twenty days of the puerperium. During this time there was a difference of 61 grams between the aggregate amounts of nitrogen eliminated by the two patients, an average daily difference of 3 grams, and it is upon the latter figure that stress should chiefly be laid. Furthermore, I feel that emphasis should be laid not so much upon the actual amount of difference, which might well vary when other individuals were subjected to similar observations, but upon the fact that a tangible difference existed and that a larger excretion occurred when the uterus was not removed.

A significant result of my observations is that the excessive excretion in Case I, amounting to 61 grams, counterbalances the nitrogenous content of the uterus of the other patient. In fact, it more than does so, for the organ contained only 38.25 grams of nitrogen. This disparity of 22 grams, however, is within the limit of experimental error when conditions must be met such as are encountered in the study of this problem.

It is, perhaps, unnecessary to point out that ideal experiments would require that one should have pregnant women of equal weight, with similar appetites, with identical powers of recuperation, and with the fortitude to remain on the same diet for a period of a month. In such cir-

cumstances mathematical precision might be hoped for, and probably would be more nearly attained; but such a favorable opportunity is not likely to present itself. And the disparity is not a large one, for it amounts roundly to 1 gram of nitrogen per day; or in other words, to a half-gram per day for each patient. Furthermore, observations upon other women whose uteri were removed at the time of Cesarean section confirm the results presented by Case II. The data given in the following table indicate that when the uterus is removed the subsequent excretion of urinary nitrogen is regularly less than when the uterus is preserved.

DAILY AVERAGE NITROGEN OF THE URINE.

After Porro-Cesarean section:	
S. C. (observed 20 days)	9.10 grams.
J. J. (observed 16 days)	10.92 grams.
A. J. (observed 10 days)	8.92 grams.
After conservative Cesarean section:	
A. W. (observed 20 days)	12.15 grams.

In the normal puerperium the involution of the uterus begins immediately after delivery and occupies about six weeks, although the acute period is practically completed by the end of the second week. The latter estimate would seem correct when judged from several points of view. For example, clinical observation of the decrease in the size of the organ indicates that the major part of the process is effected during this period, while the mensuration of the individual muscle fibers by Sänger on consecutive days throughout the process justify a similar conclusion. Furthermore, metabolic observations upon normal puerperal women indicate that the excretion of the nitrogenous products of involution is practically completed during the first two weeks of the puerperium. Consequently, if this be the period of acute involution, and if the amount of nitrogen lost from the body in consequence of the process corresponds to the nitrogenous content of the uterus removed at the time of delivery and before the commencement of

involutionary changes, it must follow that the theoretical loss of nitrogen per day should be from 2 to 3 grams. Upon comparison of this estimate with the average daily difference (3.05 grams) actually found to exist in Cases I and II, one must conclude that the excessive excretion after the conservative Cesarean section is due to the involution of the uterus. To be sure, in the case in which the uterus was removed the nitrogen output was greater for three days, but this is readily explained as a result of the anesthesia. After this period, however, the output was greater in the case in which the uterus was undergoing involution.

COMPARISON OF TOTAL NITROGEN OF URINE AFTER CONSERVATIVE AND PORRO-CESAREAN

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Case I	4.70	5.49	10.90	19.15	15.19	13.48	12.37	12.79
Case II	10.50	15.73	17.64	11.90	9.90	8.28	7.40	6.67
Difference	+5.80	+10.24	+6.74	−7.25	−5.29	−5.20	−4.97	−6.12

	Day 9	Day 10	Day 11*	Day 12	Day 13	Day 14	Day 15
Case I	12.35	12.64	14.26	11.34	12.08	11.80	14.46
Case II	7.02	8.64	9.10	8.40	8.60	8.10	6.30
Difference	−5.33	−4.00	−5.16	−2.94	−3.48	−3.70	−8.16

	Day 16	Day 17	Day 18	Day 19	Day 20	Total	Daily average
Case I	12.25	10.28	12.91	12.32	13.32	243.04	12.15
Case II	7.65	8.31	9.20	6.56	6.13	182.03	9.10
Difference	−4.60	−1.97	−3.71	−5.76	−7.19	−61.01	−3.05

As the result of my investigations it is apparent that the process of involution causes a rise in the urinary nitrogen and that the amount of excessive elimination corresponds to the nitrogenous content of the non-involuted uterus. My observations offer confirmatory evidence of the fact from three points of view: (1) by the comparison of the puerperal and postpuerperal periods when the uterus has not been removed; (2) from the comparison of the aggregate excretion in cases in which the uterus was removed and in which it was not; and (3) from the comparison of the actual

daily difference in such cases with the theoretical amount of nitrogen which would be expected as a result of the involutionary process. We may therefore conclude that waste-products from the involuting uterus pass into the circulation, are excreted by the kidneys, and in some measure throw additional work upon these organs during the early part of the puerperium.

It does not follow, however, that the diet should be restricted in the puerperium. On the contrary our observations indicate that the increase in the excretion of nitrogen is not large enough to require such restriction, provided the patient is normal. On the contrary, if any therapeutic inference may be drawn it is in the nature of a justification of the present-day tendency to allow a generous diet to recently delivered women.

On the other hand in patients suffering from toxemia of pregnancy the additional work which the kidney must perform in the puerperium does become a matter of practical importance. In such circumstances these organs should be given the fullest opportunity to recover from the strain to which they have been subjected, and, with this end in view, the diet should be limited. Such precaution is necessary not only because the renal cells have been damaged, but also because an excretory capacity somewhat greater than normal is desirable.

The inspection of the urine chart of a convalescent eclamptic teaches that in the days immediately following delivery the kidneys are eliminating an unusually large amount of waste-products, even though the consumption of food is small. Formerly, the large nitrogenous excretion in such cases was attributed to the elimination of the waste-material which had previously been retained, and whose retention had caused the toxemia. Such a view is evidently incorrect, as my observations show that the large excretion of nitrogen in these, as well as in normal cases, is due to the involution of the uterus.

Tabulation of Data

Case I (A.W.).—Conservative Cesarean section (uterus not removed)

Observation during Pregnancy

Day before delivery.	Fluid by mouth, c.c.	Quantity of urine, c.c.	Nitrogen of food, gm.	Nitrogen of urine, gm.	Nitrogen of feces, gm.	Nitrogen balance.	Weight of patient, pounds.
32 . .	1755	775	14.91	6.98	1.68	+6.25	119¾
31 . .	1755	900	15.00	9.00	1.68	+4.32	
30 . .	1755	1150	15.00	10.58	1.68	+2.74	
29 . .	1755	750	15.00	8.25	1.68	+5.07	
28 . .	1630	1325	17.30	13.25	1.68	+2.37	
27 . .	1630	860	15.70	9.48	1.68	+4.54	
26 .	1630	675	15.70	7.44	1.68	+6.58	
25 . .	1440	1000	15.70	13.16	1.68	+0.86	
24 . .	1440	1000	15.70	10.60	1.68	+3.42	
23 . .	1440	900	15.70	13.60	1.68	+0.42	122¾
Daily av.	1619	933	15.6	10.23	1.68	+3.66	

Observations during Puerperium

Day after delivery.	Fluid by mouth, c.c.	Quantity of urine, c.c.	Nitrogen of food, gm.	Nitrogen of urine, gm.	Nitrogen of feces, gm.	Nitrogen of milk.	Nitrogen of lochia.	Nitrogen balance.	Weight of patient, pounds.
1 . . .	367	300	2.63	4.70	1.20	0	1.8	−6.07	110
2 . . .	460	400	1.25	5.49	1.20	0	1.5	−6.94	
3 . .	1665	600	7.56	10.90	1.20	0	1.7	−6.24	
4 . . .	2065	850	15.06	19.15	1.20	0	0.9	−8.39	
5 . . .	1995	1085	12.33	15.19	1.20	2.2	0.5	−8.16	
6 . . .	1670	1070	9.90	13.48	1.20	2.6	..	−7.98	
7 . . .	1850	950	12.67	12.37	1.20	4.1	..	−5.00	
8 . . .	2640	1100	15.10	12.79	1.20	3.6	..	−2.49	
9 . . .	2680	1390	15.10	12.35	1.20	1.6	..	−0.05	
10 . . .	2480	950	15.10	12.64	1.20	1.9	..	−0.64	
11 . . .	2350	1350	15.10	14.26	1.20	1.4	..	−1.76	
12 . . .	2380	1350	15.10	11.34	1.20	3.1	..	−0.54	
13 . . .	1990	1570	15.10	12.08	1.20	1.9	..	−0.08	
14 . . .	2300	1290	15.10	11.80	1.20	1.7	..	+0.40	
15 . . .	2340	1270	15.10	14.46	1.20	6.3	..	−2.66	
16 . . .	2300	1250	15.10	12.25	1.20	2.1	..	−0.45	
17 . . .	2780	1450	15.10	10.28	1.20	5.6	..	−1.98	
18 . . .	2940	2100	15.10	12.91	1.20	3.0	..	−2.01	
19 . . .	3320	2200	15.10	12.32	1.20	6.0	..	−4.42	
20 . . .	2820	1850	15.10	13.32	1.20	6.4	..	−5.82	105
Daily average	2119	1220	12.88	12.15	1.20	3.3	..	−3.56	
41 . . .	1620	1300	15.70	10.56	1.45	4.9	..	−1.21	107
42 . . .	1620	1500	15.70	10.20	1.45	3.9	..	+0.15	
43 . . .	1620	1600	15.70	10.08	1.45	4.4	..	−0.23	
44 . . .	1620	1225	15.70	10.04	1.45	4.4	..	−0.19	
45 . . .	1620	1300	15.70	10.40	1.45	4.1	..	−0.25	107¼
Daily average	1620	1385	15.70	10.25	1.45	4.3	..	−0.34	

Case II (S.C.).—Porro-Cesarean section (uterus removed).

Observations during Pregnancy

Day before delivery.	Fluid by mouth, c.c.	Quantity of urine, c.c.	Nitrogen of food, gm.	Nitrogen of urine, gm.	Nitrogen of feces, gm.	Nitrogen balance.	Weight of patient, pounds.
14 . .	1550	1150	15.70	7.60	1.8	+6.30	96
13 . .	1580	1150	15.70	8.28	1.8	+5.62	
12 . .	1580	800	15.70	8.78	1.8	+5.12	
11 . .	1580	625	15.70	8.31	1.8	+5.59	
10 . .	1580	700	15.70	8.82	1.8	+5.08	
9 . .	1580	600	15.70	7.88	1.8	+6.02	
8 . .	1580	900	15.70	10.33	1.8	+3.57	
7 . .	1580	950	15.70	8.65	1.8	+5.25	
6 . .	1580	1100	15.70	8.96	1.8	+4.94	
5 . .	1580	1500	15.70	11.24	1.8	+2.66	
4 . .	1580	1350	15.70	9.45	1.8	+4.45	
3 . .	2880	2250	13.89	9.00	1.8	+3.09	
2 . .	2880	1800	13.89	8.46	1.8	+3.63	
1 . .	1760	1200	9.90	6.05	1.8	+2.05	99½
Daily av.	1776	1148	15.02	8.70	1.8	+4.52	

Observations during Puerperium

1 . .	725	600	4.41	10.50	0.95	−7.03	79½
2 . .	1510	725	9.14	15.73	0.95	−7.54	
3 . .	2480	900	12.00	17.64	0.95	−6.59	
4 . .	2480	850	12.00	11.90	0.95	−0.85	
5 . .	2480	1650	12.00	9.90	0.95	+1.15	
6 . .	2480	1800	12.00	8.28	0.95	+2.77	
7 . .	2480	1850	12.00	7.40	0.95	+3.65	
8 . .	2480	1450	12.00	6.67	0.95	+4.38	
9 . .	2480	1350	12.00	7.02	0.95	+4.03	
10 . .	2480	1200	12.00	8.64	0.95	+2.41	
11 . .	2480	1450	12.00	9.10	0.95	+1.95	
12 . .	2480	1600	12.00	8.40	0.95	+2.65	
13 . .	2480	1750	12.00	8.60	0.95	+2.45	
14 . .	2480	1650	12.00	8.10	0.95	+2.95	
15 . .	1580	850	15.70	6.30	0.95	+6.65	
16 . .	1580	950	15.70	7.65	0.95	+7.10	
17 . .	1580	1250	15.70	8.31	0.95	+6.44	
18 . .	1580	1150	15.70	9.20	0.95	+5.55	
19 . .	1580	1250	15.70	6.56	0.95	+8.19	
20 . .	1580	1250	15.70	6.13	0.95	+8.62	84¾
Daily av.	2074	1126	12.59	9.10	0.95	+2.45	

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CONGENITAL AND PLACENTAL TUBERCULOSIS

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The subjects of the placental transmission of disease and of placental pathology in general have always proved of the greatest interest to the writer. The contradictory findings that recently have been reported regarding the frequency of placental tuberculosis deserve special attention. Thus, Simepert reported having found placental tuberculosis in 80 per cent. of a series of cases; Norak and Ranzel, in 70 per cent.; Schmorl and Geipel, in 40 per cent.; Pankow, on the other hand, in a series of 20 placentas failed to demonstrate a single case, and Bossi had a similar experience. As a result of these and other equally conflicting reports it has seemed advisable to gather and study the ressult secured in a large series of cases, with the hope of throwing some light upon the actual frequency of placental and congenital tuberculosis. At the outset it became apparent that the divergent results obtained by various investigators were dependent chiefly upon three factors: (1) the standard set for the tubercle bacillus, whether the staining of acid-fast bodies morphologically similar to the tubercle bacillus was to be accepted, or whether inoculation, culture, or histological changes were to be demanded before determining the exciting cause; (2) the different types of cases from which material was obtained, acute and chronic; (3) errors in technique.

The difficulty of obtaining suitable material became evident early, for it was obviously unwise to draw conclusions from the study of a small series of specimens, no matter how carefully this was done. To meet this need the author sent a circular letter to all the members of the Philadelphia Obstetrical Society, requesting them to supply material; specimens were also obtained routinely from the author's service in the Maternity Hospital, from the gynecological department of the University Hospital, Philadelphia, from the Philadelphia General Hospital, and from the Henry Phipps Institute. In spite of the specimens secured from these sources, the author does not consider that as yet a sufficient number of specimens have been studied from which to draw positive conclusions, hence the present paper must be regarded in the nature of a preliminary report, and as a review of the theories at present held regarding this subject. For this reason an endeavor has been made to present all sides of this question and to give in moderate detail the various arguments which have been advanced from time to time regarding the frequency of tuberculosis in the products of conception as well as the theories regarding the same.

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Congenital Tuberculosis. Tuberculosis was probably recognized many hundreds of years prior to the Christian era (Williams, Osler, Waldenburg, Prodohl, and Hohne). Hippocrates (400–376 B.C.), Galen (131–200 B.C.), described the disease, and today the mortality statistics show that of all deaths from 9 to 12 per cent. are due to this affection (Rosenau). It is not strange, therefore, that the etiology of so ancient and widespread a scourge as tuberculosis should have received careful study.

It was early observed that the children of tuberculous parents were much more frequently attacked by the disease than were the offspring of healthy progenitors. Prior to the discovery of the tubercle bacillus by Koch in 1882 the theory that tuberculosis was of congenital origin received much consideration. Subsequently, however, the belief began to lose ground, and the frequency with which tuberculous offspring were born of infected parents was explained by the doctrine of postnatal infection, aided, perhaps, by a hereditary predisposition. That the majority of cases are thus caused has been proved beyond doubt. Recent investigations, however, by Schmorl and Geipel, Norak and Ranzl, Sitzenfrey, Warthin and Cowie, and others tend to show that not only does congenital tuberculosis occur, but that it may be relatively more frequent than is generally assumed.

Definition. The name "congenital tuberculosis" should be reserved for those cases in which tubercle bacilli are present in the fetus at or prior to birth. A sharp discrimination must be made between congenital infection and congenital predisposition. Numerous attempts have been made to classify infection of the embryo or fetus. Martius has strongly emphasized the distinction between the terms "congenital" and "inherited."

He applies the term "congenital" to any condition that may be present in the child at the time of its birth, and term "inherited" only to that condition which develops as the direct result of the conjugation of the two sex cells: in other words, anything that is given to the new organism from the germinative plasma. The terms "congenital" and "inherited" are somewhat confusing, and it would seem advisable to use the term "congenital" to cover both varieties of infection, and in these cases in which it may be necessary to differentiate between the two forms, to use the term "germinative" as descriptive of an infection caused by the spermatozoön or ovum, the germinative cells, applying

the denominative intra-uterine or placental infection to those cases having a hematogenous or other intra-uterine or placental origin.

Etiology. Congenital tuberculous infection may occur in a number of ways: it may be due to the spermatozoön or the ovum, the germinative infection, or the products of conception may subsequently be infected as the result of a maternal bacillemia; or it may be the result of a direct extension from surrounding structures, either by continuity or through adjacent lymph channels.

Germinative Infection. *Spermatozoic.* Tubercle bacilli have never been demonstrated within the spermatozoön In order to produce infection, however, it is not necessary for the bacilli to invade the spermatozoa, for a tubercle bacillus adherent to the outer surface of the cell may effect a similar result. A tubercle bacillus may become attached to a spermatozoön at any point along the course of the latter —testicle, vas deferens, prostatic fluid, urethra, external surface of penis, vulva, vagina, cervix, uterus, or even the Fallopian tube. It is, therefore, theoretically possible for an ovum to become infected by a spermatozoön, the tubercle bacillus having originated in the woman or been derived from an exanthropic source.

That spermatozoa may be the germ-carriers in diseases other than tuberculosis has been demonstrated (Bab, Sakurane, Fourquet, Feullee, and others), and although the likelihood of such an event occurring varies markedly in the different diseases, the possibility of their being the carriers of tuberculous infection must be considered. The presence of organisms other than the tubercle bacillus in or attached to the spermatozoön does not always inhibit the activity of the latter.

In considering this variety of infection the experiments of Waldstein and Ekler are of interest. These authors report that in normal rabbits the biological tests appeared to show

that in the female organism absorption of the spermatic fluid occurs. This observation will, however, require further verification.

Tuberculosis of the male genito-urinary tract is by no means infrequent. Viet and Martin assert that involvement of the genital tract occurs in 3 per cent. of tuberculous males. Guiteras reports that, next to the gonorrheal, the tuberculous variety is the most frequent form of epididymitis. When tuberculosis of the genital or urinary tract is present the semen frequently contains tubercle bacilli; on the other hand, in some cases, notably in that of d'Aubean, the discovery of the tubercle bacillus in the semen and the absence of lesions in the genito-urinary tract were the first evidences of the existence of pulmonary phthisis. Jani and others have reported the finding of tubercle bacilli in the testes of phthisical men in whom no demonstrable genital lesions were present. Jani found the bacillus present in five of eight cases examined. Sirenae injected the semen from a tuberculous patient into dogs, who then developed tuberculosis. Solles and Foa report similar results. Spano in six cases of phthisis demonstrated the presence of tubercle bacilli in the seminal vesicles in five. Jackh likewise demonstrated the presence of tubercle in the testicular secretion in two cases of acute miliary tuberculosis. Somewhat similar results were also obtained by Lowenstein.

Theoretically, tubercle bacilli free in the blood should not gain access to the testicular or prostatic fluid, but should become enmeshed in the fine capillaries leading to the glandular structures of the testes or prostate; Grawitz, however, showed that the mold germs, which have a larger diameter than tubercle bacilli, may, under certain conditions, reach the testicular secretion by way of the blood-stream. Murphy calls attention to the fact that it is extremely difficult, in some cases, to make a diagnosis of tuberculous seminal vesiculitis, and that probably many of the cases in

which the genitalia have been considered normal have in reality been instances in which this focus has been overlooked.

The work of Rohlff and Westmayer tends to support Murphy's opinion in that these investigators have demonstrated that tubercle bacilli are rarely present in the semen of phthisical men if genital lesions are absent. Rohlff inoculated goats and rabbits with the spermatic fluid obtained from ten men who had died of pulmonary tuberculosis, with negative results. Westmayer injected the ground-up particles of the testicles of similar subjects into the peritoneal cavity of rabbits, with like results.

Dobroklonski, by means of smears and inoculations, tested the semen of 25 men who had died of pulmonary phthisis; 24 were negative, the one positive result being obtained from a subject in whom a tuberculous epididymitis was present. Walther examined 161 sections made from the testis, epididymis, and prostates of 12 phthisical subjects without finding a single tubercle bacillus.

Gärtner injected a pure culture of tubercle bacilli into the testes of 22 rabbits and 21 guinea-pigs; he then mated these animals with 65 females. In none of the 29 rabbits or 45 guinea-pigs which were born did tuberculosis develop, except in one, the infection in this case probably being caused by food. Cornet was unable to demonstrate the presence of tuberculosis either microscopically or by culture methods in 32 fetuses and young animals bred from guinea-pigs the male parents of which had been inoculated in the testes prior to breeding. Numerous instances are on record in which fetal tuberculosis has been produced experimentally in animals by injecting cultures of tubercle bacilli into the vagina just before or immediately after coitus (Friedman, Varaldo, and others). These results are, however, valueless, for a maternal infection followed by a hemogenic infection of the products of conception was probably the etiological factor.

A tuberculous ulceration of the penis may also be the means of introducing tubercle bacilli into the vagina with the semen. Cornet mentions the possibility of tubercle-laden sputum being used as a lubricant during coitus, with resulting infection. From what has been said it would seem fair to assume that although germinative congenital tuberculosis of spermatozoic origin may occur it is extremely rare.

Unfertilized Ovum. Infection of the ovum may take place in the ovary, either before or after rupture of the Graafian follicle; in the peritoneal cavity, Fallopian tube, or even in the uterus, although it is generally accepted that fertilization of the ovum usually takes place in the Fallopian tube. As in the spermatozic infection the tubercle bacilli may be either in or attached to the ovum; in the latter event it may subsequently gain entrance with the fertilizing spermatozoön or very shortly afterward. The decidua reflexa is probably formed almost immediately after the entrance of the fertilized ovum into the uterus, so that the latter event is extremely unlikely.

Sitzenfrey, in one case, found tubercle bacilli situated in a primordial follicle of a human ovum. The patient was eighteen years old, and four years previously had had a peritonitis, presumably of tuberculous origin. At operation both adnexa were found to be tuberculous. Schottländer has produced tubercles and giant cells experimentally within developing Graafian follicles in rabbits. Landouzy believes that in rare instances infection of the ovum from a tuberculous oöphoritis or salpingitis may occur. That intra-ovarian infection of the ovum does take place has been definitely proved, but that extra-ovarian infection occurs rests only upon a theoretic basis. It is doubtful if an ovum infected within the ovary, if fertilized, could develop. Ova infected outside the ovary would naturally possess a slightly greater chance of developing.

Muffucci, Baumgarten, and others have performed numerous experiments by injecting avian tubercle bacilli into the eggs of chickens. In some cases the eggs failed to hatch or produced weak chicks that did not show tuberculous infection, whereas in others the existence of tuberculosis was demonstrated. We believe that no trustworthy comparison can be made between these results and what might take place in a woman. The fact that when intra-ovarian infection does occur the Fallopian tubes are usually involved, and are often not patulous, may to a certain extent prevent the more frequent fertilization of such ova. That the ovum may be infected by microörganisms other than the tubercle bacillus has been amply proved (Hoffmann and Walters, Levaditi and Saurage, Bab, Magalhaes, Koch, Simmonds, and others).

Congenital Germinative Tuberculosis. From what has been stated it may be seen that germinative tuberculosis may take place in three ways: (1) the tubercle bacilli may enter the ovum with the fertilizing spermatozoön, either attached to the surface of or actually within the male germinative cell; (2) the tubercle bacilli may be lodged within the ovum, which is later fertilized; (3) or the tubercle bacilli may have been attached to either the spermatozoön or the ovum and gain access to the latter shortly after fertilization. The question as to whether an infected fertilized ovum would develop is open to grave doubt.

We are willing to admit, that, theoretically, germinative infection may occur; but, viewed from a practical standpoint, this form of tuberculous infection is probably too rare to be seriously considered as a factor in congenital tuberculosis. Further investigation of this subject is necessary, and a careful study of the embryos and early gestation sacs of tuberculous parents would yield much information. The demonstration of a germinative infection is obviously extremely difficult, and most authors agree with Cornet that its existence has not yet been proved.

Placental and Fetal Tuberculosis. It is a generally accepted fact that fertilization of the ovum takes place within the Fallopian tube, probably in its outer portion, and that from this point it is carried along, by the action of the cilia of the surface tubal epithelium, to the uterine cavity, where it becomes lodged. It is possible, therefore, for tubercle bacilli to enter the fertilized ovum at any point along its course. Obviously the uterus is the most likely point for infection to take place. This may occur by four different routes: (1) hematogenic; (2) lymphogenic; (3) by direct extension through continuity; and (4) by tubercle bacilli gaining access from without.

Susceptibility to Tuberculosis. It would seem advisable, at this point, to digress and discuss briefly the action exercised by the maternal toxins and antibodies upon the presumably hitherto uninfected products of conception. This subject has received much attention and been widely discussed by Hollos, Rosenau and Anderson, Huppe, Bartel, Klebs, and many others, and the question as to whether the embryo, fetus, or child of a tuberculous mother is hyposusceptible or hypersusceptible to the action of the tubercle bacilli is still in doubt. When we consider how susceptible the fetus is to the maternal tuberculous toxins it would seem that the general nutrition must become impaired.

Carriere showed experimentally that in animals tuberculous toxins influenced pregnancy by reducing the number of the offspring, and that in many instances these died *in utero* or shortly after birth, or that those that survived were weak. The effects were most marked when toxins from both parents were injected. This investigator believed that the surviving young animals were more susceptible to tuberculous infection than were the control animals. Ballantyne states that once the tubercle bacilli have gained access to the fetal tissues they find there an excellent soil for development. Pankow inoculated a number of guinea-

pigs with portions of placentas obtained from twenty cases of suspected or congenital tuberculosis. Three of these pigs died within a few days, presumably from a toxemia, for in none of them was it possible to demonstrate the presence of tubercle bacilli.

Bossi injected the ground-up particles of placentas of tuberculous women into guinea-pigs and found that marked evidences of toxemia resulted. The effects were more lethal when placentas from women far advanced in tuberculosis or in poor general health were used and in those from patients who showed large numbers of tubercle bacilli in the sputum. Control experiments with eight placentas coming from healthy women gave negative results. Bossi, therefore, concludes that there are in the placenta of tuberculous women toxins that are transmitted to the fetus and that may cause death or miscarriage, or result in the birth of weaklings. Cornet's views agree with those of Bossi, and he believes that the toxins result from a process of osmosis. He does not, however, consider that such toxins increase the susceptibility to tuberculosis, but, on the contrary, he believes that the fetus *in utero* acquires a certain amount of immunity. With this latter view, Sitzenfrey, Hollos, and Warthin are in accord.

As has previously been stated the question of susceptibility is still an undecided one, but it would seem that the consensus of modern scientific opinion is tending toward the belief that the children of tuberculous parents exhibit a hypersusceptibility rather than an immunity to tuberculosis, and this reasoning is borne out by our own experiments, which are described in detail in subsequent pages.

The theory of Baumgarten is of special interest in this connection. This observer states that heredity has been recognized in all ages as one of the most important factors in the spread of tuberculosis, and that this is entirely the result of a direct transmission of the specific microörganism.

This opinion is based upon the few cases of congenital tuberculosis in newborn infants and animals that have been definitely proved. The paucity of such observations is explained by Baumgarten on the theory that embryonic tissue exerts an inhibitory action on the growth of tubercle bacilli, so that they may remain latent for long periods and become active after many years. That tubercle may long remain inactive, even in adults, is well recognized, and numerous instances tending to demonstrate this latency are quoted by Baumgarten. In support of this theory he goes so far as to assert that tubercle bacilli may be transmitted through several generations in a latent form, only to become active in one of the descendants. This last belief is certainly an extreme one and has no foundation on fact.

The atavistic transmission theory would suppose that the tubercle bacilli would pass to either the father or the mother and settle in one of the testicle or in the ovary, remaining latent there for years, and that finally the particular infected germinative cell should become the source of an embryo which would develop. This assumption is based on the vaguest of theoretic grounds. Sitzenfrey, however, states that direct transmission to the child may occur *in utero*, and that the tubercle bacilli may remain latent for prolonged periods, sometimes for two or three years or even longer.

The doctrine of the latency of tuberculosis has received a strong impulse by Behring, who asserts that pulmonary phthisis in adults is frequently the result of infection acquired during childhood through the ingestion of contaminated milk. This conclusion is based partly upon the fact that the digestive tract of young animals lacks, to a large extent, the protective properties that are present in later life. This latter belief, however, is founded largely upon theoretic grounds, and many arguments against it can be adduced.

Rosenau states that a hereditary tendency may be transmitted, and that such tendency may be demonstrated by

the power of the individual to react. Rosenau states that this view is borne out by an analogy in the experiments upon anaphylaxis in guinea-pigs, in which it has been shown that hypersusceptibility to a foreign proteid, such as tuberculosis, may be transmitted. On the other hand, however, Webb and Williams have produced a certain amount of immunity in guinea-pigs and monkeys by the injection of living tubercle bacilli.

Undoubtedly many cases have been recorded in which tubercle bacilli were positively demonstrated in large numbers in the fetus or newborn child, no other pathological changes being present, a finding that requires further study.

Resistant Power or Immunity to Tuberculosis Possessed by the Newly Born Animals of Healthy Parentage. In this series twelve newly born guinea-pigs were employed. One-half of the series received intravenous injections of 0.01 c.c. of a pure culture of tubercle bacilli, diluted with 5 c.c. of sterile physiological salt solution; the remainder were injected with 0.001 c.c. of tubercle bacilli diluted with a similar amount of salt solution. All these animals died or showed marked evidence of advanced tuberculosis within six weeks or less. As a rule the lungs, intestines, and peritoneal cavity were involved. Tubercle bacilli were demonstrated in all the animals. The value of this experiment is limited, as these animals were naturally deprived of the possible immunizing properties of the maternal blood, the mothers having been healthy. The experiment does show, however, that the newborn animals exhibited but slight resistance even to small quantities of highly diluted cultures of tubercle bacilli.

Resistant Power or Immunity to Tuberculosis Possessed by the Newly Born Animals of Tuberculous Mothers. This series of experiments was performed upon twelve newly born guinea-pigs whose mothers had received, during the last week of pregnancy, intravenous injections of 0.5 c.c.

of a pure culture of tubercle bacilli. The mothers all subsequently died or were killed, and all presented well-marked evidences of tuberculosis. The young animals received the same treatment as those in the first series. The young in this second series, although presumably the recipients of whatever immunizing power was present in the maternal blood, all shared the same fate as those of the first series the lesions being quite as marked and becoming manifest equally early. Tubercle bacilli of similar strain were employed in all the injections, so that the young were subjected to the same type of organism as were the mothers. It is interesting to note that no abortions or dead fetuses followed the experiment, this result differing from that obtained by Bossi. Three of the guinea-pigs were weak at birth and died prior to the eighth day. Too much stress should not be laid on the mortality rate of these young animals, as the effects of inoculation may be held to have been, as they probably were, more or less responsible for their deaths, although the fact that they appeared weak at birth is not to be lost sight of. As the results show, in none was immunity present. It might be argued that some of these young animals were infected *in utero*, and while this is possible, at none of the postmortems were evidences of marked involvement of liver or adjacent lymphatics found, areas which, it would seem, would be most likely to become infected if the condition were due to congenital lesions.

An extensive review of the literature on immunity would be impossible in the limited space of a paper of this character; we may, however, quote Cornet, who is an authority upon this subject. This author asserts that the repeated injection of the various products of tubercle bacilli results in a gradually increased tolerance of the same. This is true not only of healthy but also of tuberculous animals. Recent investigation has shown that this immunity is similar in many respects to that obtained with other poisons of a proteid

nature. Doses of tuberculin, like those of other bacterial poisons, could be gradually or rapidly increased until a maximum of tolerance be reached, varying in different individuals, and beyond which chronic poisoning would be likely to develop. The symptoms that accompany this form of poisoning are loss of weight, anemia, and debility. It is possible, therefore, that in some cases, especially in the chronic ones, the tuberculous products circulating in the maternal blood may be small in amount or of lessened virulence, whereas in other animals these may be of sufficient virulence seriously to impede the development or nutrition of the fetus.

Clinically the writer has observed infants who were strong and healthy at birth, the offsrping of mothers in the last stages of tuberculosis, as well as infants of similarly infected mothers who were weak and puny. The author believes, therefore, that the last word regarding immunity under these conditions has not as yet been said and that further experiment is necessary before this point can be definitely settled.

Action of Maternal Toxin and Antibodies upon the Fetus. Congenital Tuberculosis. A third series of 18 guinea-pigs were injected, both intravenously and intraperitoneally, during the last weeks of pregnancy. In this series 48 young were born; 2 of the guinea-pigs died before giving birth to young, and in none of these did the fetuses show evidences of tuberculosis. The placentas of these fatal cases likewise gave no histological evidence of tuberculosis, nor were inoculations from them successful in producing the disease. Examination of the ground-up particles of the placentas by the antiformin method in two cases showed acid-fast bodies morphologically similar to tubercle bacilli. The reliability of this method of demonstration of the tubercle bacilli will be considered on subsequent pages.

Of 36 young that were born, 6 were dead and 12 died

prior to the tenth day. All the young were transferred to healthy foster mothers within twenty-four hours of birth, and were kept in cages that had previously been sterilized. This last was done to prevent postnatal infection. Although the mortality in this series was high, in none of the young that died and in none of the remainder that were killed at the end of the sixth week was tuberculosis present. In all the mothers of series 2 and 3 it was observed that shortly after labor there seemed to be an acceleration in the progress of the disease; this was most notable a few days after the termination of gestation and is of special interest in that it bears out the theory that when a bacteriemia is present large numbers of circulating microörganisms become enmeshed in the intervillous spaces and, as a result of the uterine contraction of labor, many of them are expelled into either the maternal or even the fetal circulation. All the injected mothers died or were killed, and all showed the presence of tuberculosis in more or less advanced stages.

These experiments, while not numerous, were conducted with the greatest possible care. For the purpose of demonstrating tuberculosis in the dead animals, smears, cultures, and histological and in some cases inoculation methods were resorted to. While it is admitted that the results of experiments on animals can never apply to analogous conditions in man, such results are nevertheless of value. Too positive an opinion regarding the action of the tubercle bacilli on the pregnant woman or the products of conception should not, however, be drawn from such experiments. As the result of the investigations just outlined the following conclusions are offered tentatively:

1. That but little if any maternal immunity is exhibited on behalf of the fetus. If any exists, it is slight or extremely transient.

2. The young were found to be susceptible to tuberculosis.

3. The proportion of weak young was abnormally high the result, apparently, of the effect of the maternal toxins.

4. The mortality among the young animals was also high.

5. Beyond the fact that in a few cases there was more or less emaciation at birth, there was no marked reduction in the size of the young animals; indeed, in one or two instances an extremely well-nourished litter was born of a mother in whom the disease was far advanced.

6. Tuberculosis in the mothers did not result in abortion; however, but few of the mothers were in extremely bad condition at any time during gestation.

7. Failure to produce congenital tuberculosis was demonstrated.

8. A marked acceleration in the progress of the tuberculosis in many of the mothers was observed shortly after labor.

Tuberculous Bacillemia. That tuberculosis in not infrequently a bacillemia is, the writer believes, a generally accepted fact. The differences of opinion that exist among various investigators regarding the frequency with which tubercle bacilli can be demonstrated in the blood-stream are of interest. Rosenberger claims to have been able to demonstrate the organism in a large proportion of cases. In the main, such findings have not been confirmed by most investigators. Not a few believe that Rosenberger's results were due to a faulty technique. Most authorities agree that tubercle bacilli are present in the blood-stream under certain conditions, especially in the acute miliary form of the disease and in the terminal stages; that they are probably not constantly present, are frequently few in number, are generally difficult to demonstrate, and that slight errors of technique may lead to erroneous conclusions (Rump, Liebermeister, Guerner, Dressen, Gobel, Klemperer, Kahn, Kessler, Bacmeister, and others). The writer believes, with Fränkel, that the microscopic examination of the blood for tubercle bacilli is likely to prove misleading, and that

the inoculation of animals is the only possible means of arriving at correct conclusions. Of 22 persons examined by Fränkel only 2 gave positive results. Elsaesser tested 41 cases of advanced tuberculosis, and was able to demonstrate the microörganism in 7.3 per cent. of cases. Begason recovered the organism in only 2 of 41 patients, although he employed 10 c.c. of blood. The work of Massel and Breton recently reported by Calmette is of especial interest in this connection. These investigators found that tuberculosis could be produced with relative frequency by the direct transfusion of blood from a tuberculous to a healthy guinea-pig. By this method it was possible to transmit tuberculosis quite frequently even from animal in whom the disease was chronic or the lesions comparatively small.

To be of value the blood examination must be carried out with great care. Gobel, Blandes and Mau, Bogason, Bacmeister, Bautigam, and many others caution against accepting as tubercle bacilli acid-fast bodies found in the blood by the Saubli-Schnitter technique, as they may or may not be the bacilli in question.

Pregnancy is prone to light up a latent or chronic tuberculosis and thus produce a condition in which a bacillemia is likely to be present. Secondary infection and metastasis occur in the placenta in the same manner in which they affect other portions of the body. Bardeleben goes so far as to assert that the placenta is the locus minores resistentus of the gravid woman.

The fate of the tubercle bacilli in the circulating bloodstream is of importance. Wild is of the opinion that the organism multiplies in the blood itself, a statement that is not borne out either clinically or from a study of the biology of the tubercle bacillus. Tubercle bacilli do not develop well in fluid media, where they exhibit their aversion to liquids by multiplying only on the surface and at the edges. Indeed, mere wetting of the organism inhibits or retards

its growth. Cornet declares that in order to produce a bacillemia a simultaneous or practically simultaneous invasion of large number of bacilli is necessary.

The Histology and Physiology of the Placenta in Relation to the Routes of Transmission of the Tubercle Bacilli. For a thorough understanding of placental and congenital tuberculosis a knowledge of the pathology that occurs in these conditions is necessary. An important point that immediately presents itself to the investigator is whether or not the transmission of the tubercle bacilli occurs through the normal placenta. A number of cases are no record in which congenital tuberculosis has been observed in the child and no histological changes were detected in the placenta. Even more numerous are the cases in which tubercle bacilli were demonstrated in the placenta, or fetus and placenta, and in which no histological changes were found. In accepting these cases as genuine, care must be observed for, as previously stated, the demonstration of tubercle bacilli in the blood, either by staining methods or by animal inoculation, is not reliable unless a strict technique is adhered to. It must alse be remembered that in order positively to prove that the placenta in a given case was normal the entire structure must be subjected to serial section. So far as can be ascertained this stupendous task has never been accomplished, and even if it were the possibility that healing may have occurred in the placenta after the tubercle bacilli were transmitted could not be entirely excluded. Warthin and others have described the healing of tuberculous lesions in the placenta.

The placental transmission of syphilis, leprosy, variola, anthrax, pneumonia, and recurrent fevers has been positively demonstrated in man (Lubarsch, Bergmann, Schaudinn, Paschen, Wallich and Levaditi, Menetrier and Rubens Duval, Neuhaus, Freund and Levy, van der Wittigen, Dorland, Runge, Nattan-Larrier and Brindeau, Delestre, Bar and Renon, and others).

Preyer, Savory, Fournier, and others have demonstrated that toxins injected into the mother may produce the death of the fetus. As early as 1877 Zweifel showed that chloroform administered to the mother also affected the fetus.

Under normal circumstances the blood in the intervillous spaces is entirely maternal in origin (Waldeyer, Bumm, Leopold, etc.), as the fetal blood at no time gains direct access to the intervillous spaces, the two blood-supplies being separated from each other by the vessel wall and the two layers of chorionic epithelium. During the latter stages of pregnancy Langhans' layer is, however, absent. It seems probable that when material is transmitted through the placenta the process is effected partly be osmosis and partly by the direct action of the syncytial cells, the physiology of the latter being somewhat analogous to that of the renal tubules. Williams and Cornet are of the opinion that when the placenta is normal and the epithelium covering the villi is intact, transmission of the disease germs cannot occur, but that when lesions of the placenta are present, transmission may take place. It remains to be decided, however, whether the lesions that have been demonstrated in some cases of tuberculosis have antedated the disease, or whether they have been the result of tuberculous toxins produced by the bacteria in the intervillous blood. Delore is of the opinion that the disorganization of the syncytium is not the result of toxins or of inflammation, but is due to a myxomatous degeneration. Warthin believes that the syncytium of the chorionic villi is no more immune to the action of the tubercle bacilli than is the vascular endothelium in other parts of the body, and that the theory that tubercle bacilli can pass through this layer of cells without causing injury to it is founded on fact. Sitzenfrey is of a similar opinion. In this connection it should be stated that the intervillous spaces are not lined by endothelium except for a short distance on the surface of the decidua basalis, into

which the endothelium of the maternal vessels extend. The author is of the opinion that tubercle bacilli may be transmitted through the normal placenta. This opinion is based upon the fact that a number of cases are on record in which undoubted congenital tuberculosis has been present and a careful examination of the placenta has failed to show histologic lesions in the same.

In the case of tuberculosis, at least, this question is perhaps of more theoretic than of practical value. It is probable that the toxins the result of enmeshed tubercle bacilli, may produce injury to the syncytium, and thus by the damage incurred, prepare the way for the entrance of tubercle bacilli. Furthermore, in the latter months of pregnancy infarcts are frequently present, and doubtless constitute foci by which ingress is secured for the organisms in the intervillous spaces.

Williams describes five varieties of infarcts. All placentas contain small infarcts, and Williams states that these attain a diameter of 1 cm. or more in 63 per cent. of cases. Owing to the histologic structure of the decidua basalis and placenta, these structures offer especial facilities for the enmeshing of microörganisms circulating in the maternal blood-stream, a point that has recently been emphasized by Warnekros.

It is probable that in the majority of cases in which congenital infection occurs the tubercle bacilli travel through the decidual arteries to the covering of the villi, and there accumulate, causing thrombi in their own and in adjacent intervillous spaces, with subsequent destruction of the syncytial cells, enter the villous stroma, and finally reach the chorion. To what extent this process is aided by the action of the toxins is not definitely known, but it would seem probable that they act as predisposing factors and tend to weaken or even destroy the intervening layers of cells.

Schmorl and Kockel, in their carefully prepared report of the pathology of placental tuberculosis, state that placental

villi, even when entirely embedded in the tuberculous areas, tend to retain their integrity and are easily differentiated from the surrounding tissue. "Even the identical villus on which the primary localization of the tubercle bacilli occurred, and which, in consequence, lacks its cellular sheath in places, remains for a long time unchanged. The tubercle bacilli may be very plentiful in the tuberculous new growth, yet within the villi surrounding this area we find but few." These authors further declare that even if the villus becomes tuberculous, a thrombosis and partial obstruction to the vessel occur, which may entirely or in part prevent the passage of the bacillus.

As has previously been stated, the infarcts that are so frequent in the latter months of pregnancy also probably serve as channels for the invading microörganisms. The virulence of the infecting agent and the resistant power of the host are also probably important factors in the production of the disease. It is a significant fact that a large proportion of the reported cases of congenital tuberculosis have occurred in conjunction with the acute miliary variety of the disease.

Undoubtedly the strong uterine contractions incident to labor constitute a most important factor in the transmission of tubercle bacilli at the end of pregnancy. Organisms that, prior to the onset of labor, were lodged in the placenta or in the intervillous spaces, may, as the result of these contractions, be forced into the fetal circulation. Schlimpert, Schmorl and Geipel, Warthin and Cowie, Bardeleben, and others are very insistent on this point. Tubercle bacilli are relatively frequently transmitted through macroscopically normal placentas, and may possibly pass through histologically normal organs, although positive proof of the latter is lacking.

In addition to the hematogenous infection, tubercle bacilli may reach the decidua from the Fallopian tubes or cervix, and thence, by continuity, pass into the placenta. A lym-

phatic infection from an adjacent tuberculous lesion may also occur. In either of these ways a focus of infection is set up in the decidua, and may extend to the chorion, thus reaching the body of the fetus, and infecting it through the respiratory tract, the result of inspiration of the amniotic fluid, through the gastro-intestinal tract, or through the skin. Asch and numerous other observers have recorded instances of supposed intra-uterine sucking, and even in adults whose dermis should be more resistant than that of the fetus, infection without macroscopic loss of continuity has occasionally been observed (Leloir, Baginsky, and experimentally by Wasmuth, Roth, and others). In a case described by Schmorl and Geipel a tuberculous area in the chorion had penetrated the amnion, and tubercle bacilli were found on the surface of the Catier membrane. Herrgott inoculated guinea-pigs with the amniotic fluid of a tuberculous woman who died in the sixth month of pregnancy. The animals developed tuberculosis, showing that, in this case, the amniotic fluid contained virulent tubercle bacilli.

Aside from the infarcts previously mentioned and the fact that high fever is likely to produce a loss of continuity of the maternal and fetal bloodvessels and thus favor transmission of the bacillus, disease of the placenta other than tuberculosis may produce lesions that will facilitate the occurrence of a congenital infection by opening up avenues for the entrance of tubercle bacilli. This is particularly the case of syphilis, of which Hochsinger's case is an example. Trauma may also serve as a predisposing factor in the transmission of the bacillus through the placenta.

In examining specimens of suspected congenital tuberculosis the greatest care must be observed to exclude cases of possible extra-uterine infection. As pointed out by Virchow, syphilis may closely simulate tuberculosis. Henle described a case of pseudotuberculosis in newborn twins.

It must be remembered that placental tuberculosis does not necessarily imply a transmission of the infecting organsim to the fetus, although, of course, the condition strongly favors congenital tuberculosis, for if advanced, it must produce lesions that facilitate the passage of the bacilli through the placenta.

Frequency of Congenital Tuberculosis. Tuberculosis is the most frequent serious infectious disease that attacks mankind. It has been estimated that from 9 to 12 per cent. of all deaths are due to tuberculosis. In Germany, during one year, the mortality statistics show that diphtheria, pertussis, scarlatina, rubeola, and typhoid fever were accountable for 116,705 deaths, whereas during a similar period tuberculosis was responsible for 123,904 deaths.

Genital tuberculosis is by no means an uncommon affection. Genital lesions are predisposing factors to congenital tuberculosis, especially if the Fallopian tubes are patulous. The frequency of this form of infection is, therefore, of especial interest. In the gynecological laboratory of the University of Pennsylvania it has been found that 7 per cent. of all cases of pelvic inflammatory diseases are of tuberculous origin. Williams found that 8 per cent. of all cases of adennitis were tuberculous. Merlitti places the proportion at 12.6 per cent. The reports from the University Laboratory and from Williams are based upon operative material, and are of special value, as in both clinics all specimens are subjected to a routine histological examination. Martin found 24 tuberculous cases among 1600 gynecological specimens. Barkely in 789 autopsies performed upon women dead of tuberculosis found the genital tract involved in 7.7 per cent. In 174 cases of similar material from the Henry Phipps Institute, examined by the writer, 6.6 per cent. showed macroscopic involvement of the genitalia.

In studying the frequency of congenital tuberculosis a

number of points must be considered. The great prevalence of tuberculosis and the comparatively small number of authentic cases of congenital infection that are recorded are conclusive proof, it would seem, of the rarity of the variety of the disease in question. On the other hand it should be remembered that tuberculosis of the placenta does not by any means always present macroscopic lesions. There is, moreover, probably no branch of pathology that has received less attention than that concerning the placenta. Baumgarten's theory, although doubtless extreme in some respects, has done much to show that congenital tuberculosis may occur and that tubercle bacilli may remain latent in the child for quite prolonged periods. Under these circumstances congenital tuberculosis is probably mistaken for and classified as a postnatal infection. The occurrence of congenital tuberculosis in cattle and the transmission, through the human placenta, of microörganisms of other diseases are points tending to show that congenigal tuberculosis is more frequent than is generally supposed.

Until comparatively recently it was the general belief that congenital tuberculosis rarely if ever occurred, and for this reason but few placentas were examined in order to determine its existence. As has been stated, even a negative histological examination does not by any means exclude the presence of tubercle bacilli in the placenta, and it is only by routine histological and bacteriological examinations of a large series of placentas and other products of conception from tuberculous women that reliable conclusions can be reached regarding the frequency of placental and congenital tuberculosis. Owing probably, to the difficulties of securing such material a sufficiently large number of such examinations have not been made. Sitzenfrey's series of 26 cases is the largest I have found in the literature. When such studies have been carefully carried out the results have almost invariably shown that the presence of tubercle

bacilli in the placenta is by no means infrequent. It is a significant fact that recent investigators have found both congenital and placental tuberculosis much more frequent than did those of the previous decade, the result, probably, of the more thorough methods of study now employed.

Bossi failed to find tubercle bacilli in any of the placentas examined by him. Pankow, in a series of twenty placentas from tuberculous women, was unable to demonstrate tuberculosis in a single case. Despite this fact, however, this investigator believes that placental and congenital tuberculosis are not rare. Schmorl and Geipel, on the other hand, found 8 cases (40 per cent.) of tubercle bacilli in the placenta in a series of 20 tuberculous women. Schlimpert found the tubercle bacilli in the placenta in 8 of 11 cases. Sitzenfrey in a series of 26 cases found the organism in 7, and recovered the infecting bacilli twice from the fetal blood.

Norak and Ranzel examined the placentas from 10 cases of advanced pulmonary tuberculosis. The placentas were minced, washed in sterile water, digested in soda solution and pancreatin, and then mixed with 40 per cent. antiformin solution (a proprietary mixture of an alkaline hydrochloride and an alkaline hydrate). The sediment was again washed in alcohol, stained, and examined for tubercle bacilli. A histological examination of the placentas was also made, and inoculation of guinea-pigs was likewise carried out in many cases. As a result these authors found positive evidence of tuberculosis in 7 of the 10 specimens examined. They regard the negative findings of other observers, especially those of Bossi and Ascoli, as due to faulty technique or, that probably, as in some cases, the specimens were obtained from early pregnancies, in which case the infection would most likely be limited to the decidua. A summary of the cases of Schmorl and Geipel, Norak and Ranzel, Schlimpert and Sitzenfrey, shows that of 67 cases examined, 30 per cent. presented positive evidence of tubercle bacilli

in the placenta, placental tuberculosis, or congenital tuberculosis.

Many of the earlier results secured regarding the demonstration of congenital or placental tuberculosis are open to criticism, because of the methods employed. Von Leyden inoculated animals with portions of the liver, spleen, and lungs of a child born of a tuberculous mother, with negative results. Jaquet was unable to find tubercle bacilli microscopically in several human fetuses of tuberculous mothers. Vignal inoculated portions of the livers and spleens of 11 human fetuses of tuberculous mothers into guinea-pigs, with negative results. Treisser performed similar experiments with the livers and lungs of three stillborn infants of tuberculous mothers, with similar results.

Bernard, Debrer, and Baron, in a series of 36 cases of advanced tuberculosis, found the placenta involved in 12.5 per cent. Bar and Renon found tubercle bacilli in the blood from the umbilical cord in 2 of 5 cases in which the mothers were tuberculous. It should be stated, however, that one, at least, of Bar and Renon's cases was not above suspicion.

The varying results shown in the foregoing statistics are in themselves evidence pointing to the necessity of encouraging further investigation of this subject. Although none of the series is very extensive the diversity in the results secured would seem to be due largely to variations in the technique employed. It is difficult to determine who is at fault; certainly the studies of Sitzenfrey and Norak and Ranzel must especially impress the reader with the thoroughness and care with which the experiments were carried out. The class of cases from which the material is secured is also an important factor, as bacilli would, as a matter of course, be expected to be much more frequent in acute febrile subjects than in those in whom the lesions were quiescent or of a chronic character.

Armann regards tuberculosis in infants as not infrequently

of congenital origin. As a general rule in hematogenous infections tubercle bacilli attack the lymphatic glands nearest their point of entry. In congenital tuberculosis, therefore, the liver, being the inlet for the placental blood, the lymphatic glands in this region would be expected to exhibit the first changes, and this is frequently the case. That the liver possesses some bacterioidal properties should, however, be taken into consideration. In those infants in whom the liver is the organ chiefly involved, this fact is at least suggestive of congenital tuberculosis. Leroux, in 214 autopsies performed upon tuberculous infants, found the liver affected in 82. Lannelonge, in 1005 cases of surgical tuberculosis occurring in young children and infants, observed 3 that he considered of congenital origin. Müller, in 150 autopsies performed on tuberculous children, found the liver involved in 33.3 per cent. of cases. Haupt was able to demonstrate that of 617 of his tuberculous patients, 143 had tuberculous mothers.

In 1834 Hardy reported the history of a case of tuberculosis of the uterus and placenta occurring in a phthisical woman. The report is, however, somewhat vague, and in view of the general ill-defined knowledge of the pathology of tuberculosis at that period, this case must be regarded with doubt. The cases of Charrin and Jacobi are, for similar reasons, also open to suspicion.

Until 1891 no undoubted case of congenital tuberculosis had been recorded. During that year 2 cases were reported, 1 by Sabouraud and 1 by Schmorl and Birch-Hirschfeld. The latter authors were the first positively to demonstrate the presence of tubercle bacilli in the haman placenta.

Runge regards his case as the first in which tubercle bacilli were positively identified in the decidua. As usual no giant cells were found, but numerous tubercle bacilli were present, chiefly in the decidua basalis. Johne was perhaps the first to report the history of an undoubted case

of congenital tuberculosis, his specimen consisting of an unborn calf. Macroscopically the uterus and placenta were normal. Since the publication of Johne's case, many instances of congenital tuberculosis in animals have been recorded. As early as 1897 Klepp reported that he found numerous calves affected with this form of the disease, and stated that 2.63 per cent. of all young born of tuberculous cows were infected *in utero*. Cases of congenital tuberculosis in cattle have been reported by Malvox and Brouwier (2 cases), Czoker, Bank (3 cases), McFadyean, Siegen (38 cases), Lungwitz (2 cases), Nocard, Grancher, Kohler, Misselwitz, Bayersdorfer, Beckers, Ruser, Baerland, Galtier, Bucher, and Lohoff. The frequency of congenital tuberculosis in cattle can probably be accounted for by the fact that the genital tract is often involved in these animals, even primary genital tuberculosis being by no means rare. The somewhat indefinite standards adopted by veterinarians must, however, be taken into consideration.

The recent carefully prepared report of Brooks tends to show that the frequency of congenital tuberculosis in cattle has been exaggerated. Of 200 calves born of tuberculous parents, all of which were immediately after birth removed from the mother and guarded from postnatal infection, not one became tuberculous.

Efforts to Produce Congenital Tuberculosis; Animal Experiments. Gärtner, in an extensive series of experiments upon white mice, succeeded in producing congenital tuberculosis in from 5 to 10 per cent. of cases. This was effected by making intraperitoneal, intravenous, and intratracheal inoculations. Of 19 litters in which the mothers were subjected to intraperitoneal injections of 0.001 to 0.002 c.c. of a pure culture of tubercle bacilli, in 2 cases the young became infected. In an attempt to simulate miliary tuberculosis (bacillemia) this investigator injected 0.5 to 2 c.c. of a pure culture of tubercle bacilli into the vein of the ear

of 10 healthy rabbits. Of 51 fetuses of young born to these animals, 5 (10 per cent.) were tuberculous. In no case were all the young of a litter infected. The method of determining whether or not infection was present in the young was extremely thorough; it consisted of grinding the young or fetuses to a pulp, and inoculating this into the peritoneal cavity of guinea-pigs. For the purpose of producing conditions analogous to pulmonary tuberculosis, Gärtner injected a drop of a pure culture of tubercle bacilli into the trachea of 64 mice; 18 litters consisting of 74 young resulted. These were inoculated into 39 guinea-pigs, and tuberculous young were found in 80 per cent. of the litters. Another similar series of experiments performed at a later date upon 28 subjects, showed only one infected young animal Landouzy and Loedenih performed a similar series of experiments, 2 of the 86 young animals which resulted showing congenital tuberculosis. Numerous other investigators have, however, failed to produce congenital tuberculosis. Sanchez-Toledo performed intravenous infection on 15 guinea-pigs, and in none of the 25 fetuses from these animals was tuberculosis present. Similar results were secured by intrathoracic inoculation.

A summary of Sanchez-Toledo's results show that no tuberculosis was demonstrated in 65 fetuses from 32 tuberculous mothers. Cornet, in an extensive series of experiments, was unable to produce congenital tuberculosis. Of 233 fetuses or young examined not one was tuberculous. In the writer's own experiments, which have previously been quoted, none of the 48 young from tuberculous mothers showed evidence of congenital infection. Von Nocard inoculated 32 fetuses of 4 tuberculous rabbits into 32 guinea-pigs, with negative results. Wolff performed a similar test, employing 42 fetuses of rabbits and guinea-pigs, with one positive result. Galtier was unable to demonstrate tuberculosis in 9 young from tuberculous guinea-pigs and in one calf from a tuberculous cow. Grancher and Straus obtained

similar results from the inoculation of suspected organs of fetuses from 9 tuberculous female guinea-pigs; 14 of the progeny were inoculated at birth, with negative results, and the remainder were examined at varying periods up to sixteen months of age. Tuberculosis could not be demonstrated. Vignol performed similar experiments with 11 guinea-pig fetuses from tuberculous mothers, with negative results. Carajnis, by inoculating the spleen of a fetus from a tuberculous guinea-pig, secured a positive result. From the findings just recorded, it can well be seen that congenital tuberculosis is difficult to produce experimentally.

In studying congenital tuberculosis, a sharp distinction must be made between placental infection and fetal involvement. It by no means follows that because a placental infection exists, the child is necessarily contaminated.

Criticism and Possible Sources of Error. Attention has elsewhere been directed to the small number of cases of congenital or of placental tuberculosis in man that have been reported, and possible reasons for this have been advanced. It appears incredible that, after the publication from such an authoritative source as were Baumgarten's researches, that twenty-two years should have elapsed without some demonstration of the fact that this form of infection is frequent if this were really the case. A review of the literature since 1891 shows that much work has been done on this subject, and that the opinion of most observers is strongly opposed to the view that holds that the condition is frequent. On the other hand a careful review shows that in most of the investigations in which a moderately large number of specimens were examined and thorough methods of research employed a definite proportion of cases were demonstrated. It is also worthy of note that the majority of these investigations are of comparatively recent date and that the results have been greatly influenced by the thoroughness of the technique employed.

The microscopic demonstration of tubercle bacilli alone in smear preparations is in some cases to be looked on with suspicion, as the differentiation of other acid-fast bodies must be carefully considered—a point that should be emphasized. I believe, with Fränkel and others, that the microscopic demonstration in smear preparations of blood is likely to be misleading. Slight errors in technique or the presence of acid-fast bodies other than tubercle bacilli are prone to produce very erroneous results. The findings of Norak and Ranzel, which have previously been quoted and whose experiments were evidently carefully carried out, may be placed partly in this category.

It would seem extremely unwise in the present state of our knowledge regarding congenital tuberculosis to accept results based only upon the finding of isolated bodies resembling tubercle bacilli in blood-smears or similar preparations, especially when the proportion of infected cases found by this method far exceed the number determined by inoculations. This has been the case in a number of series in which a high proportion of congenital tuberculosis has been found. It has been claimed, with justice, by those who regard smear preparations as reliable that the organisms thus found are identical, both morphologically and tinctorially, with the tubercle bacilli, and that when the method is safeguarded by the employment of sterile vessels and tested distilled water, etc., such results are trustworthy. The fact that such blood when inoculated has failed to produce tuberculosis has been explained on the ground that the tubercle bacilli are few in number and that the human blood probably possesses a partial bactericidal action which inhibits or destroys the virulence of the bacilli. Furthermore, that smear preparation from the sputum, although the conditions are not altogether analogous, are accepted without question. The question is by no means settled, and more work should be performed before a positive stand

is taken. Sitzenfrey has very properly sounded a note of warning against accepting even inoculation results unless the technique has been carefully safeguarded. The frequency of tuberculosis among laboratory animals, and the possibility that incipient tuberculosis may have been present before the inoculation was made; the possibility of contamination during, prior, or subsequent to the inoculation and the marked susceptibility of guinea-pigs to this form of infection are all sources of possible error. Feyerabend has even mentioned the possibility of spontaneous tuberculosis occurring in guinea-pigs. Even the histologic examination is open to misinterpretation. The similarity of the picture produced by certain forms of syphilis and other conditions to that of tuberculosis has previously been pointed out.

Experimentally produced congenital tuberculosis in animals is likewise not beyond criticism. The relatively large amounts of culture material inoculated usually far exceed what could possibly be present in the pregnant woman. Thus Gärtner, whose results are perhaps more convincing than those of any other investigator, employed quantities of culture which, if increased proportionately to the weight of an average woman, would amount to 350 gm. introduced into the trachea; 35 to 140 gm. into the circulation, and about 0.5 to 1.5 liters into the peritoneal cavity. These results show, therefore, that while congenital tuberculosis may be produced experimentally in certain animals, it should not be compared to what takes place in the tuberculous pregnant woman.

A summary of the researches previously quoted, including the results of the author's own experiments, shows that of 530 fetuses whose mothers had been inoculated with tubercle bacilli in varying quantities, 46 showed tubercle bacilli, When the susceptibility of guinea-pigs (the animals usually employed in these tests) and the large quantities of the material usually employed are considered, these experiments

may be regarded as proof of the rarity of congenital tuberculosis. An analysis of the results obtained in efforts to produce congenital tuberculosis, in view of the markedly divergent results secured, can lead to but one conclusion, and that is that these discrepancies are due to the different methods employed, *i. e.*, either a different standard for the demonstration of the tubercle bacilli or definite errors in technique. There is a striking analogy between the results secured following attempts to produce congenital tuberculosis in animals and those attained by investigators who reported their findings in the examination of the products of conception of tuberculous women, some finding a relatively large proportion of congenital tuberculosis and others few cases or none. Gärtner's results, showing 5 per cent. of congenital tuberculosis in some series and in others as high as 50 per cent. of the litters infected, can be accounted for on no other grounds than those just stated.

Many investigators attempt to draw an analogy between tuberculosis and syphilis, relapsing fever, and other infectious diseases known frequently to be of congenital origin. Such an analogy, however, is erroneous. In tuberculosis bacilli are present in the blood-stream in large numbers only under exceptional conditions, as for example, in the acute miliary variety of the disease or just before death. Furthermore, it has been definitely proved that tubercle bacilli do not multiply or even thrive in the circulatory blood, characteristics which mark the spirocheta pallida. The clinical metastases which are generally so frequent in tuberculosis are probably due to isolated organisms, which are swept away from the primary focus and carried to other localities, where they find lodgement, these bacilli living in the blood-stream only long enough to be carried from the original lesion to the area in which they find lodgement.

Period at which Intra-uterine Transmission is most likely to Occur. Placental tuberculosis is undoubtedly

most frequent in the latter months of pregnancy. As gestation progresses the maternal focus in the lungs or elsewhere is especially prone to exacerbations, and, as a result, organisms are more likely to be present in the maternal blood-stream. Furthermore, hyperpyrexia tends to produce a solution of the continuity of the fetal and maternal blood-vessels. Not only is a bacillemia prone to develop at this time, but a great quantity of blood is passed through the placenta. The larger amount of blood present in the placental sinuses and the relatively slow blood-current at this period predispose to the enmeshing of tubercle circulating in the maternal blood-stream. The placenta itself is probably now more receptive to tuberculosis than during its earlier development. Langhans' layer of cells is absent. As the end of pregnancy approaches the placenta assumes characteristics that have caused it to be termed a senile organ (Willliams, Eden, Warthin, Cowie, and others). Very early hematogenous infection is also unlikely to take place; indeed during the first few weeks the chorionic villi are devoid of bloodvessels and are nourished entirely by osmosis.

As has previously been stated, some authorities regard the placenta as a secure filter that prevents the organisms of a maternal bacteremia from gaining access to the fetus. This is true to a certain extent. This theory is based upon the assumption that the syncytium of the placenta is everywhere intact. Certainly in the latter months of pregnancy the chorion undergoes progressive atrophy. Anemic infarcts are constantly present in the placenta, and at these points egress is offered for the maternal microörganisms. It is probable that the fibrinous exudate which forms in these areas is an important factor in safe-guarding the fetus. The bactericidal properties of the blood are perhaps also sufficient to destroy or inhibit the growth of a certain proportion of the tubercle bacilli. Indeed, Warthin and Cowie believe that it is only under certain circumstances, or when

the organisms are present in large numbers, that transmission is likely to occur.

When tubercle bacilli are present in the intervillous spaces, labor itself, with its incident strong and frequent uterine contractions, is especially prone to force the microorganisms into the fetal blood-stream. That labor is a powerful agent in the production of congenital tuberculosis has been recognized by practically all observers; in fact, Dardeleben goes so far as to perform Cesarean section as a prophylactic operation before the onset of labor in certain cases.

Predisposing Factors to Placental or Congenital Tuberculosis. As most of these factors have been mentioned in the preceeding pages, only a summary will here be given. Excluding the germinative type, the existence of which rests merely upon a theoretic basis, the requirements for a placental infection to take place are a tuberculous bacillemia or a tuberculous focus in the immediate neighborhood of the placental site. Under predisposing factors, therefore, must be placed all conditions that favor the presence of tubercle bacilli in the maternal blood-stream, such as acute miliary tuberculosis, tuberculosis florida, ulcerative lesions that tend to rupture into bloodvessels, acute exacerbations of the disease, and a high temperature, which in itself tends to destroy the continuity of the bloodvessels. In this connection, however, it must be remarked that Warthin has recently described a case of placental tuberculosis in which the lung lesion was quiescent, and the attention of the attending physician was called to the tuberculosis only by finding of miliary tubercles in the placenta.

Syphilis and other disease of the placenta, as well as trauma, probably not only predispose to the development of placental tuberculosis, but undoubtedly serve as predisposing factors in the production of congenital tuberculosis by forming avenues of egress for the circulating or enmeshed tubercle bacilli.

Tuberculosis of the peritoneum or of the female genital tract is also a predisposing factor to infection. The author has, however, seen two cases of advanced tuberculous peritonitis in pregnant women, and in neither was there gross evidence of infection in any of the products of conception. Unfortunately a thorough examination could not be made in either case. Williams has observed a somewhat similar case.

The Fate of the Congenitally Tuberculous. Under this heading Cornet formulates an extremely unfavorable prognosis for children who are the victims of this variety of infection. The author's experiments and those of others apparently show that embryonic and fetal tissues possess no immunity to tuberculosis, results that are borne out by clinical evidence. Indeed, it is not improbable that a hypersusceptibility, perhaps partially the result of malnutrition, exists. It is certain that if the fetus were infected during the early months of pregnancy, intra-uterine death or abortion would be not unlikely to follow, whereas if the infection occurred late, it is probable that tuberculosis would manifest itself in the liver or adjacent lymphatic glands. It would appear, therefore, that the prognosis would be decidedly less favorable in the case of a congenitally infected child than in one who acquired the disease postnatally. Furthermore, the virulence of the strain of infecting organism is of importance in this connection. The mothers of congenitally infected children are often the incumbents of an acute miliary tuberculosis, a form of disease in which the organisms are usually extremely virulent.

Author's Observations

Case I.—Aged twenty-six years.

(*a*) Variety of tuberculosis: ischiorectal. Pulmonary abscess. Wassermann, positive.

(*b*) Duration of the tuberculosis: three months.

(*c*) Fever? Fever before delivery, 98° to 100°. Pulse, 100 to 140. Respiration, 30 to 40.

(*d*) Did tuberculosis become worse during pregnancy? Yes, but especially so after delivery.

(*e*) Did the diagnosis rest upon the clinical proof or upon the demonstration of tubercle bacilli? Both.

(*f*) Is the husband tuberculous or not. No.

(*g*) Advancement of pregnancy? Nine months.

(*h*) Condition of child? Fair at birth, subsequently died. No postmortem permitted.

The specimen was delivered November 9, 1913, and placed on ice thirty-six hours before examination. Guinea-pigs were inoculated intraperitoneally with blood and portions of the placenta. Macroscopically the placenta was normal in size. Numerous infarcts, none larger than 0.5 cm., in diameter, were present. A few flattened, whitish-yellow areas were present on or near the maternal surface. These are friable, avascular, and somewhat suggestive of areas of caseation.

November 10, 1913. Material: blood from the umbilical cord and placental tissue. Two guinea-pigs inoculated.

Guinea-pig, No. 1, black, inoculated with 0.5 c.c. of blood from umbilical cord.

Guinea-pig, No. 2, black, white, and brown, inoculated with placenta.

Results: Guinea-pig No. 1 died on January 13, 1914. No tuberculosis found.

Guniea-pig No. 2 still living.

Case II.—Aged twenty-six years.

(*a*) Variety of tuberculosis: Advanced bilateral pulmonary. Ulceration on both apices.

(*b*) Duration of tuberculosis: seven years.

(*c*) Fever? 99° to 104° preceding delivery.

(*d*) Did tuberculosis become worse during pregnancy? Markedly so with laryngeal development.

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli? Both.

(*f*) Is the husband tuberculous or not? Husband and three children. The woman was the primary focus of the disease.

(*g*) Advancement of pregnancy: seven months.

(*h*) Condition of child? Placenta previa and dead child.

Patient had chronic but advancing pulmonary phthisis on both sides for seven years. For the last four weeks she has suffered from rapidly advancing pharangeal and laryngeal involvement. For the last week, when she first came under observation, the temperature ranged from normal to 104°. Pulse, 90 to 140. Respiration, 30 to 40. The patient was pregnant at about 6.5 or seven months. On November 10 the patient started to bleed, and it was found that she had placental previa (marginal). It was referred to the University Hospital. Decapitation and delivery.

Placenta: This is normal in size for seven months advancement. It shows a number of infarcts and one small whitish area about 0.5 cm. in diameter. This contains rather dry, cheese-like material.

Fetus: It is practically negative.

Lungs: Show a few, small, whitish areas which somewhat resemble miliary tubercles.

Liver: Does not show any marked evidences nor does the spleen. The retroperitoneal lymph glands are also negative.

November 13, 1913. Material: placenta and baby. Four guinea-pigs inoculated.

Guinea-pig, No. 1, white with light ears, inoculated with placental extract.

Guniea-pig, No. 2, white with black ears, inoculated with splenic pulp.

Guinea-pig, No. 3, Brown and black, inoculated with liver pulp.

Guinea-pig, No. 4, brown, white, and black, inoculated with lung pulp.

Result: Guinea-pig No. 3 and No. 4 died twenty-four hours after inoculation and No. 2, forty-eight hours after inoculation. No tuberculosis found. Guinea-pig No. 1 died March 1, 1914; the lungs, peritoneal cavity, and liver are positive for tubercle bacilli. Large quantities of tubercle bacilli were found.

CASE III.—Aged thirty-four years.

(*a*) Variety of tuberculosis: advanced pulmonary with cavity formation on right side and consolidation of left apex.

(*b*) Duration of tuberculosis: three years.

(*c*) Fever? hyperexia.

(*d*) Did the tuberculosis become worse during pregnancy? Much worse. Died a few days following delivery.

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli? Both.

(*f*) Is the husband tuberculous or not? Not known.

(*g*) Advancement of pregnancy? Six months.

(*h*) Condition of child: Premature death after two weeks.

The family history was negative for tuberculosis. The patient had pleurisy and pneumonia three years ago. The present trouble began six months ago with cough. Pulmonary condition: extensive pneumonic consolidation with softening of the entire left lung with cavity formation. Small cavity found at the right apex with marked infiltration. She was six months pregnant when delivered of a still-born fetus. Since becoming pregnant she became very much worse, dating the beginning of her illness from that time though one would know from the extensive involvement that it began a long while before. The exact date is not known. No positive report on sputum.

November 14, 1913. Material: placenta; one guinea-pig inoculated.

Guinea-pig, light brown, black left leg, inoculated with placental extract.

Result: March 3, guinea-pig still living.

Case IV.—Aged twenty-eight years.

(*a*) Variety of tuberculosis: Pulmonary. Is now in maternity hospital with pneumonia. Room-mate has phthisis.

(*b*) Duration of tuberculosis? Not known.

(*c*) Fever? Temperature, 100.5°.

(*d*) Did the tuberculosis become worse during pregnancy? Yes.

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli? The sputum was not tested.

(*f*) Is the husband tuberculous or not? Is suggestive of tuberculosis.

(*g*) Advancement of pregnancy? Term.

(*h*) Condition of child: fair. There is a deformity demanding operation.

November 19, 1913. Material: placenta; one guinea-pig inoculated.

Guniea-pig, white, dark spotted ears, inoculated with placental extract.

Result: animal still living on March 3, 1914.

Case V.—Aged thirty-six years.

(*a*) Variety of tuberculosis: pulmonary; unilateral ulceration.

(*b*) Duration of the tuberculosis: six or eight months?

(*c*) Fever? Temperature of 98° to 100.5° before delivery.

(*d*) Did tuberculosis become worse during pregnancy? Not markedly so.

(*e*) Did the diagnosis rest upon the clinical proof or upon the demonstration of tubercle bacilli? Clinical.

(*f*) Is the husband tuberculous or not?

(*g*) Advancement of pregnancy: term.

(*h*) Condition of child: normal.

The patient had a cough for three months previous to delivery. Free expectoration. The placenta is normal in size and appearance and has been kept for some days in normal salt solution, and as a consequence is partially decomposed. For this reason no inoculations have been made.

Case VI.—Aged thirty-five years.

(*a*) Variety of tuberculosis: pulmonary. Both apices moderately ulcerated.

(*b*) Duration of tuberculosis: about nine months.

(*c*) Fever? Temperature, 98° to 100° before delivery.

(*d*) Did tuberculosis become worse during pregnancy? Yes.

(*e*) Did the diagnosis rest upon the clinical proof or upon the demonstration of tubercle bacilli? Both.

(*f*) Is the husband tuberculous or not? Yes.

(*g*) Advancement of pregnancy? Term.

(*h*) Condition of child: good.

The placenta and cord are normal in size. The fetal surface of the placenta is macroscopically normal as are the membranes. The maternal surface of the placenta is more or less covered by blood clots and when these are removed by washing in distilled water a number of small, irregular but well-defined and slightly elevated yellowish areas are observed which vary in size from a few mm. to 1 cm. On section these are soft and somewhat cheesy. In another area on the same surface the placental tissue is softened, somewhat paler in color than the surrounding tissue and is distinctly less fibrous. These areas measure about 2 x 2 cm. on the surface and penetrate for perhaps 1 or 1.5 cm.

December 1, 1913. Material: placenta, one guinea-pig inoculated.

Guinea-pig, dark brown and light brown, white face, inoculated with placental extract.

Result: guinea-pig still living.

Case VII.—Aged twenty-two years.

The specimen consists of a placenta and fetus.

Placenta: measures 11 x 12.5 x 2.75 cm. and has been hardened (partially) in formalin before coming to the laboratory. The cord measures 35 cm. in length. Attached to the surface of the placenta are a few blood clots. In its present condition, no changes are observed. On section no suspicious areas are observed.

Fetus: Measures 34.5 cm. in length. It is a female and like the placenta, has been hardened. It presents no abnormalities.

Postmortem of the fetus: In the pleural cavity is a considerable quantity of clotted blood. The lungs, beyond a little edema are, however, normal. In the pericardium there also appears to be free blood.

Peritoneal cavity: The liver is enlarged. The lower portion is somewhat degenerated and infiltrated with blood. This is probably postmortem in origin. Nothing markedly suggestive of tuberculosis is observed. A few lymph glands, just below the pylorus of the stomach are enlarged to about the size of a millet seed and a number of what appear to be enlarged glands are also present in the mesentery of the transverse colon. These enlargements vary from 0.5 to 1.5 mm. and are yellowish white in color.

December 3, 1913. Material: placenta; one guinea-pig inoculated.

Guinea-pig, white, black left eye: inoculated with placental tract.

Result: still living on March 3, 1914.

Case VIII.—December 11, 1913.

The specimen consists of a placenta which is normal in shape and size. It measures 18.5 x 16 x 2.5 cm. The membranes are normal as is the maternal aspect. The cord measures about 57 cm. in length. It also presents no abnormalities. On section, the placenta presents no sus-

picious areas. Histological preparation, antiformin and injection of placenta.

December 11, 1913. Material: placenta, six guinea-pigs inoculated with placental extract.

Result: December 21, one guinea-pig died. Suspicious lesion found in the lungs. On spread and section of lesion no tuberculosis was found. January 5, 1914, a second guinea-pig died, no tuberculosis found. On March 3, 1914, two pigs were killed and fonnd negative for tubercle bacilli. Two pigs are still living.

Case IX.—Aged twenty-one years.

(*a*) Variety of tuberculosis: Chronic pulmonary.

(*b*) Duration of tuberculosis: one year.

(*c*) Fever? Yes. Temperature 99° to 99.3°.

(*d*) Did the tuberculosis become worse during pregnancy?

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli?

(*f*) Is the husband tuberculous or not? No.

(*g*) Advancement of pregnancy? Full term.

(*h*) Condition of child? Dead. Decapitation for malposition.

The specimen consists of a full term placenta which measures 15.5 x 13.5 x 5 cm. The cord measures about 70 cm. The maternal aspect of the placenta is divided into eight lobules, the line of separation being about 1 to 2 cm. The surface is partially covered by blood-clots. A number of whitish areas which macroscopically resemble infarcts are present. On section these prove to be suspicious and composed of moderately firm, whitish, slightly translucent tissue. The membranes and cord show no pathologic process. An emulsion has been made by grinding the placenta with sand, the emulsion being as thick as possible to go through the needle. About 4 c.c. of this emulsion has been injected into the intraperitoneum of each of six guinea-pigs.

Case IX.—December 11, 1913.

Material: placenta; six guinea-pigs inoculated with placenta.

Result: December 29, one pig died, no tuberculosis found. Remaining pigs still living on March 3, 1914.

Case X.—Aged thirty years.

(*a*) Variety of tuberculosis: pulmonary. Large cavity in the right lung.

(*b*) Duration of tuberculosis: two months.

(*c*) Fever? Before delivery had a temperature of 103°.

(*d*) Did the tuberculosis become worse during pregnancy? Yes. Death a few days after delivery, from genital tuberculosis.

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli? Both.

(*f*) Is the husband tuberculous or not?

(*g*) Advancement of pregnancy: eight months.

(*h*) Condition of child? Premature, very small, very much emaciated, and weighed 2 pounds 12.5 ounces at time of birth. It died a few days later.

The specimen was in the ice-box seventy hours before inoculation was made (six guinea-pigs). The placenta measures 12 x 11 x 2.5 cm. It is normal in shape. It contains one, large, whitish area which is firm and which macroscopically resembles an infarct. Attached to the maternal surface are a number of chicken fat clots. The cord measures about 43 cm. in length and is macroscopically normal.

December 16, 1913. Six guinea-pigs were inoculated with ground-up placenta mixed with a little sterile water.

December 29, one pig died. Autopsy showed a pyogenic infection negative for tuberculosis.

December 30, two pigs died. Autopsy showed a pyogenic infection. No evidence of tuberculosis.

February 2, one pig died. Autopsy showed the macroscopic picture of tuberculosis. The lymph glands of the

omentum were enlarged and caseous. Tubercle bacilli were demonstrated from the enlarged lymph glands and from the liver and spleen.

March 9, 1914, one pig died. The lungs, liver, spleen, and lymph glands of the omentum were positive for tuberculosis.

March 13, one guinea-pig was killed and found pregnant. This guinea-pig was found positive for tubercle bacilli especially in the peritoneal cavity. Smears from one fetus were negative for tuberculosis.

March 13, six guinea-pigs inoculated with the products of conception. Black, white and yellow, chiefly black: with amniotic fluid. The remainder were inoculated with an emulsion of the liver and spleen.

Case XI.—Aged twenty-nine years.

(*a*) Variety of tuberculosis: pulmonary ulcerative.

(*b*) Duration of tuberculosis? Six months.

(*c*) Fever? Yes.

(*d*) Did the tuberculosis become worse during pregnancy? Yes.

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli? Both.

(*f*) Is the husband tuberculous or not? Not known.

(*g*) Advancement of pregnancy? Seven and one-half months.

(*h*) Condition of child? Very small and emaciated. Weighed 2.5 pounds, otherwise it is normal.

The placenta measures 14 cm. in diameter and 2 cm. in thickness. The umbilical cord measures 31 cm. in length and 1.25 cm. in diameter. It shows a normal, slightly eccentric insertion. The placenta, membranes and cord appear macroscopically normal.

Fetus: The specimen consists of a macerated infant measuring 37 cm. in length and aged thirteen days. The postmortem was performed on the seventh day after death.

Since death it has been on ice. The skin of the abdomen is greenish in color. The peritoneal cavity contains an excess of fluid. The intestines show the usual postmortem changes. No enlarged glands are present. The liver is macroscopically normal. Beyond postmortem changes, the lungs are also normal. No enlarged glands are present anywhere.

December 22, 1913. Material: placenta and blood from umbilical cord. Seven guinea-pigs inoculated.

Guniea-pigs, white, yellow, and brown, inoculated with the blood. Six other guinea-pigs inoculated with placental extract.

Result: December 30, January 12 and January 19, one guinea-pig died, respectively, all injected with placenta.

February 23, 1914, one guinea-pig died. There were a few lymph glands and a few yellowish spots in the liver but no tubercle bacilli.

February 24, one brown guinea-pig inoculated subcutaneously and one white guinea-pig inoculated intraperitoneally, with material of large lymph gland from guinea-pig that died February 23, 1914.

March 2, 1914, one guinea-pig died. This was negative for tubercle bacilli.

Case XII.—Aged eighteen years.

(*a*) Variety of tuberculosis: pulmonary.

(*b*) Duration of tuberculosis: four months.

(*c*) Fever? At times none at present.

(*d*) Did the tuberculosis become worse during pregnancy? Yes.

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli? Both.

(*f*) Is the husband tuberculous or not? Not known.

(*g*) Advancement of pregnancy? Full term.

(*h*) Condition of child? Good.

The specimen consists of a placenta measuring 15 cm. in diameter and 2 cm. in thickness. The umbilical cord measures 63 cm. in length and is inserted almost in the

centre of the placenta. The cord presents a number of false knots along its course. The membranes appear complete. The placenta presents nothing suggestive of tuberculosis.

December 30, 1913. Material: placenta, six guinea-pigs inoculated with placental extract.

Results: January 1, 1914, one guinea-pig died. No tuberculosis found.

February 4, 1914, one pig died. This presented a purulent peritonitis. Smears from the peritoneal fluid, omentum, and enlarged glands were negative for tubercle bacilli, but show numerous bacilli and cocci, none of which were acid-fast.

The remaining guinea-pigs are alive.

Case XIII.—Aged thirty-eight years.

(*a*) Variety of tuberculosis? Pulmonary (chronic).

(*b*) Duration of tuberculosis? Seven years.

(*c*) Fever? No.

(*d*) Did the tuberculosis become worse during pregnancy? No.

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli? Both. Patient has a cavity in the lung. She lives at White Haven, Pa. No active lesion for seven years.

(*f*) Is the husband tuberculous or not? No.

(*g*) Advancement of pregnancy? Term.

(*h*) Condition of child? Good.

The placenta measures 18 cm. in diameter and 2.5 cm. in thickness. The umbilical cord is inserted in a normal manner near the centre and measures 37 cm. in length. The membranes appear to be complete. The maternal surface shows the presence of a few, small, whitish, fibrous areas.

December 30, 1913. Material: placenta. Six guinea-pigs inoculated with placental extract.

Result: one guinea-pig died day following the injection. Negative.

The remaining guinea-pigs are alive.

Case XIV.—Aged thirty years.

(*a*) Variety of tuberculosis: Pulmonary.

(*b*) Duration of tuberculosis: One year.

(*c*) Fever? Not any now.

(*d*) Did the tuberculosis become worse during pregnancy? Remained about the same.

(*e*) Did the diagnosis rest upon the clinical proof or upon the demonstration of tubercle bacilli? Both.

(*f*) Is the husband tuberculous? Yes.

(*g*) Advancement of pregnancy: Eight and one-half months.

(*h*) Condition of child: well nourished.

The placenta shows no marked abnormalities. It measures 12 x 13 x 3.3 cm. The umbilical cord measures 34 cm. in length. The membranes are intact and present no abnormalities. On section, nothing suspicious is observed. A few white bodies, which are probably infarcts are present.

January 28, 1914. Material: placenta, six guinea-pigs inoculated with placental extract.

Result: all animals still living.

Case XV.—Aged twenty-one years.

(*a*) Variety of tuberculosis: tuberculosis of the glands of the neck since twelve years old.

(*b*) Duration of tuberculosis: nine years.

(*c*) Fever? Not any.

(*d*) Did the tuberculosis become worse during pregnancy?

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli? Upon clinical proof.

(*f*) Is the husband tuberculous or not? No.

(*g*) Advancement of pregnancy? Term.

(*h*) Condition of child: good.

The specimen consists of a placenta and membranes which present no marked gross abnormalities. The organ mesaures 17 x 15 x 2.75 cm. The umbilical cord measures 47 cm. in length. The membranes are smooth and macroscopically normal. The maternal surface of the placenta is smooth, somewhat lobulated and shows no abnormalities or suspicious areas. Numerous sections through the placenta fail to show any abnormalities.

Case XV.—Aged thirty-one years.

January 28, 1914. Material: placenta. Six guinea-pigs inoculated with placental extract.

Result: all animals still living.

Case XVI.—Aged twenty-nine years.

(*a*) Variety of tuberculosis: pulmonary, far advanced.

(*b*) Duration of tuberculosis: three years.

(*c*) Fever? Not for the last two years; formerly constant.

(*d*) Did the tuberculosis become worse during pregnancy? Improved under rest and proper hygiene.

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli? Clinical.

(*f*) Is the husband tuberculous or not? No.

(*g*) Advancement of pregnancy? Term.

(*h*) Condition of child: nine pounds. Well developed and no cough.

The specimen consists of a placenta, membranes and cord. The specimen weighs about two pounds and has unusually tortuous vessels on the external surface. The cord measures two feet in length and 2 cm. in diameter, presenting no unusual gross appearance. The membranes are complete presenting a tear about 5 inches in diameter. The placenta is irregular, nodular, purplish-red with minute yellowish points on the external surface. Some of these are the size of a pin-head, while others appear in the form of minute crosses. Section presents a spongy red surface.

Immediately before the appearance of the child, large masses of yellowish gelatinous material was discharged.

January 31, 1914. Material: placenta. Six guinea-pigs inoculated.

Result: one guinea-pig died February 1, 1914. Another guinea-pig died on March 6. This was negative for tubercle bacilli.

Case H. J., aged twenty-five years.

(*a*) Variety of tuberculosis: bilateral pulmonary. Chronic with extensive eye involvement.

(*b*) Duration of tuberuclosis: two years.

(*c*) Fever? No.

(*d*) Did the tuberculosis become worse during pregnancy? Yes. Pulmonary and eye lesions developed.

(*e*) Did the diagnosis rest upon clinical proof or upon the demonstration of tubercle bacilli? Both.

(*f*) Is the husband tuberculous or not? No.

(*g*) Advancement of pregnancy: abortion on account of advancing symptoms of tuberculosis.

(*h*) Condition of child? Two children. One was dead and macerated, the other was viable for a few minutes.

The specimen consists of a placenta and two fetuses.

Placenta: This is apparently single and is somewhat torn. It measures 5.5 cm. in diameter and to it is attached an apparently normal umbilical cord, 16.5 cm. in length. The placenta does not show any gross abnormalities.

Fetus No. 1: measures 16 cm. in length and is well formed and apparently perfect in every way. Attached to it is a piece of umbilical cord, measuring 4 cm. in length.

Fetus No. 2: Is of equal length but the body and head have become almost completely flattened out, evidently the result of pressure, while in the amniotic sac. The right foot of this fetus is missing and the entire body appears to be in a state of degeneration. Both fetuses are males. On

account of the fact that the specimen had been in fixing fluid, no inoculations were made.

Histological Examination. All the preceeding specimens have been subjected to histologic examination, in some cases eight or ten blacks being taken from a single placenta. In none of these has tuberculosis been found.

A summary of the above observations shows that of 14 cases examined, two were positive for placental tuberculosis while the majority of the remainder the inoculated animals are still under observation.

The original manuscript contained abstracts of all the reported cases of congenital and placental tuberculosis that the author has been able to collect from the literature. For the purpose of brevity, these have been omitted from the present report. The references to them may be found in the bibliography.

Conclusions. *Congenital Tuberculosis.* (1) This is a rare condition; a number of authentic cases have, however, been recorded. That transplacental infection is most likely to occur in the last few weeks of pregnancy and especially as a result of uterine contraction during labor and the well-known latency of tuberculosis are facts which are suggestive that this variety of infection may in some instances be mistaken for a postnatal infection.

2. As a result of congenital infection the liver and adjacent structures, especially the lymph glands are the localities most frequently attacked.

3. The prognosis in the congenitally infected is unfavorable; first, because of the vital character of the organs usually involved; and secondly, owing to the virulent type of organism usually present; maternal bacillemias rarely being found except in a virulent type of infection.

4. For a congenital hemogenic infection to occur a maternal bacillemia and a permeability of the placenta must precede the condition.

5. Whether tubercle bacilli can be transmitted through the normal placenta is still undetermined; certainly when lesions are present the placenta cannot be regarded as a secure filter.

6. Pre-existing lesions in the placenta, especially those produced by syphilis are predisposing factors to the transmission of tubercle bacilli.

7. Lesions in the placenta may be produced by the tnbercle bacilli themselves which may result in conditions favoring the transmission of organisms to the fetal circulation.

8. The presence of tubercle bacilli in the placenta is undoubtedly of more frequent occurrence than was formerly believed and in view of the results obtained by recent investigations a more thorough study of the question of the frequency of congenital tuberculosis is desirable.

9. Until a fairly large series of fetuses and newly-born infants can be thoroughly studied by carefully performed histologic and inoculation methods the relative frequency of this type of infection cannot be determined.

10. The presence of tubercle bacilli in the placenta by no means infers a congenital infection, but is undoubtedly a predisposing agent.

11. Congenital tuberculosis can be experimentally produced in animals; but only in a small percentage of cases and even then as a rule only by the injection into the mother of what is relatively enormous quantities of a pure culture of tubercle bacilli. Such results can hardly be compared with what occurs in the pregnant tuberculous woman.

12. Animal inoculation is the most reliable method of testing for the presence of tubercle bacilli either in the placenta or fetus.

13. The animals should be tested with tuberculin before inoculation and carefully guarded from possible extraneous infection subsequently to injection.

14. As an additional safe-guard, a second series of animal should be inoculated from those dead of the primary injection. This should be performed for the purpose of positively determining the virulence of the microörganisms as it is, at least theoretically, possible that dead tubercle bacilli might be present. This precaution was adopted in many of our cases and in all in which there was the least ground for doubt. It was positive in all cases.

15. Whereas the antiformin method is of value, the acceptance of one or two acid-fast bodies morphologically similar to the tubercle bacillus demonstrated in a large series of slides is unreliable. At least one such body was discovered in every specimen examined by the author. In some instances, as many as 200 slides from a case were examined. The first six specimens so tested were placentas from tuberculous women and the last two from non-tuberculous patients. In only one of the eight specimens were the findings confirmed by inoculation and in this specimen *numerous* tubercle bacilli were present in the slides. After the first six cases the antiformin method was abandoned and the results obtained by it excluded. It should be stated that in the employment of the antiformin method, every effort was made to safe-guard the results, only sterile utensils, freshly distilled water, etc., being used. The water employed was also repeatedly tested always with negative results.

16. *Prophylaxis:* In certain types of maternal tuberculosis, tubercle bacilli are not infrequently present in the placenta. Undoubtedly the most frequent period at which transplacental infection occurs is during labor, for this reason the umbilical cord in these cases should be tied as soon as possible, certainly without waiting for the pulsation to cease.

17. The child should be taken away from the mother immediately and carefully guarded against postnatal infection.

18. *Placental Tuberculosis.* Placental tuberculosis may result from infection of the spermatozoön or ovum. This assumption is based upon theoretic grounds only and is probably extremely rare, too rare to be of much practical importance.

19. Placental tuberculosis may result from a direct extension from a nearby focus such as a preëxisting endometritis. This also is probably a comparatively rare variety.

20. Placental tuberculosis may result from a hemogenic infection. This is the most frequent variety. It requires a maternal bacillemia, a condition in which itself is comparatively infrequent.

21. Bacillemias are most frequently present in the acute miliary form of tuberculosis; when ulcerative lesions break into adjacent bloodvessels; when hyperexia is present, a condition which tends to impair the integrity of the bloodvessels; and during acute exacerabtions of the disease. It is worthy of note that in the tuberculous woman, pregnancy frequently produces an exacerbation of the disease and results in conditions favorable for the production of a bacillemia.

22. Tubercle bacilli are frequently present in the placenta without macroscopic lesions, as proven by our own investigations and those of others. This is a much more frequent condition than are actual macroscopic lesions.

23. Tubercle bacilli when found in the placenta are frequently virulent.

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IN MEMORIAM

HENRY J. GARRIGUES, M.D.

Born June 6, 1831. Died July 7, 1913.

By Brooks H. Wells, M.D.
New York

(By Special Request of the Council)

Thirty years ago a tall, grave-faced man stood in the delivery-room of a New York city hospital, sickle-shaped knife in hand, ready to do a symphyseotomy on an obstetric patient who presented all the proper indications and who could not otherwise have been delivered of a living child. All preparations had been made and the staff stood expectant to see the new Italian operation which at that time had never been done on any woman in America. But the operator hesitated, shook his head slowly, and then laid down his knife. "No," he said, "I will not do it, for if the woman should die I would be criticised by my colleagues."

Yet this man who thus put aside the opportunity for a surgical triumph had, just one year before, done that which was in the end to bring him lasting fame and the blessings of many mothers.

Surgery had already shed much light on the age-old question of wound infection and sepsis, yet, in 1883, no one had fully grasped the fact that the genital tract after child-birth was essentially an open wound and that child-bed fever was a fever from wound infection and that wound infection was caused by bacteria.

Holmes, whose life extended into the memory of some who are present here today, had a prophetic vision of the facts when, in his immortal essay on puerperal fever, he said: "The

time has come when the existence of a private pestilence in the sphere of a single physician should be looked upon not as a misfortune, but as a crime."

The furious criticism which this statement caused had hardly died away when Semmelweiss (five years later), a young assistant at the Vienna Maternity, was fiercely attacked for his dicta that "Every case of puerperal fever is caused by the absorption of putrid animal material."

Playfair, in the fourth edition of his *Midwifery*, issued in 1882, included all postpartum fevers under the head of septicemia, but admitted "there were facts difficult to reconcile with theory and for which we were unable to give a satisfactory explanation." Gusserow in the same year admitted that locality was of less importance than was formerly supposed and that Semmelweiss was correct in defining puerperal fever as a wound infection.

Madden, at the meeting of the British Medical Association in August, 1883, held that it did not matter by what term we distinguished the malady, provided we recognized it as a "specific infectious disease consequent on parturition, and largely modified by the intensity of the septicemic condition, by the previous condition of the patient, and by the prevailing epidemic constitution of the atmosphere."

At the University of Dublin it was taught by Kinkaid that "such fever, from whatever sources arising, except septicemia, is a specific infectious disease, occurring epidemically and sporadically like any other infectious disease."

In a somewhat heated discussion before the New York Academy of Medicine in December of 1883, T. G. Thomas, then one of our members, defined puerperal fever as "an infectious disease due, as a rule, to septic inoculation of wounds in the genital tract." He admitted that some toxic agent existed, but riduculed the idea that the "round micrococcus" could be an important factor in its etiology. Polk thought Thomas should have planted himself squarely upon the view which regards puerperal fever as identical with septicemia. Fordyce Barker, who still clung to the old dogma of a specific disease, held these ideas up to ridicule. "Does every parturient woman," he asks, "in performing the function of maternity, like the scorpion that carries in its tail an agent for suiclde if death be threatened by fire, physiologically generate an equally fatal poison in a corresponding locality?"

It is seen by these references to contemporary opinion that while the bulk of the profession held more or less to the idea of a septic poison, there was much concerning the exact nature of this poison that was vague.

Yet the time and opportunity were waiting for the one who should have the clear insight and the courage to put aside the ancient dogmas of the established order and to replace them by the new ideals of surgical cleanliness.

As to the conditions found only too often in the maternities before the days of asepsis, conditions that, thank God! cannot now be seen and can hardly be imagined, it is sufficient to quote from Polk's description of the wards of the lying-in service at Bellevue, when at the end of the civil war he found himself an interne at that hospital. Listen to his statement: "Sixty cases a month of confinement was then the record of that institution. As I went on duty I found every bed filled with a septic case, and as I shifted to the dead-house those who had been there upon my entrance, I merely put in their places others stricken as fatally as those whom I had originally found, so that out of sixty cases of confinement which fell under my care during that month fifty-five passed into the dead-house, and of that number only two died of causes other than sepsis."

Compare this with the present mortality in our maternities, a mortality from sepsis of less than 0.1 per cent.

In the first nine months of 1883, of 345 deliveries at the New York Maternity Hospital, 30 women died and the serious morbidity was enormous. In September the conditions were at their worst. Ten of the women delivered during the month died—about one in four—and the survivors escaped miserably with their lives.

At this time (October 1) the rotation of service brought Dr. Garrigues in charge. He proved to be the man superior to the emergency. Appalled at the frightful conditions he had already formulated, he at once carried into effect a detailed plan for driving out the pestilence. This plan was original in its detail, showed a broad comprehension of the principles of asepsis, was brilliant in its achievement, and of far-reaching influence on the practice of obstetrics. Though its details are now commonplaces, yet it may be of interest to repeat them here.

Rapid alternation of wards was secured, so as to allow fre-

quent fumigation with sulphur, followed by scrubbing with soap and water and by a 1 to 1000 bichloride solution. Fresh bedding was furnished at each change. The floors were sprinkled four times daily with the bichloride solution. All visitors were rigorously excluded. Doctors and nurses employed in the maternity were not allowed to enter the other hospital wards or the dead-house. The patient had a bath and clean linen beforehand, and on entry to the delivery-room the abdomen, genitals, buttocks, and thighs were washed with soap and water and then with bichloride solution. The vagina was irrigated with two quarts of the solution from a glass fountain syringe with a glass nozzle. The rubber sheet on the delivery bed was frequently renewed and washed before each delivery with the 1 to 1000 solution.

No vaginal examination was allowed except after the hands had been thoroughly scrubbed with soap, hot water, and a stiff brush, and soaked in a hot 1 to 1000 bicholide solution.

When the head appeared at the vulva a piece of gauze soaked in the bichloride solution was applied and kept there. After the expulsion of the child the genitals were kept covered by a similar compress. The placenta was expressed by Credé's method so that it might not be necessary to introduce the finger inside the vulva. If it became necessary to introduce the finger to remove placenta or membrane the vagina was washed out, otherwise not.

Intra-uterine injections were used only when the hand or instruments were introduced into the cavity of the uterus or after the birth of a macerated child. After the expulsion of the placenta the vulva and adjacent parts were washed with the solution and the vulva covered with a large gauze compress wet with the solution. Before every washing the nurses disinfected their hands as before labor. No vaginal injections were used except in fetid lochia. Every substance brought in contact with the genitals was soaked beforehand in the solution.

There are yet some who may remember the ridicule that greeted the announcement of these measures; there are more who remember how the pestilence gathered its terrors to itself and fled away. Even today the only point that can be seriously criticised is the free use of the bichloride solution. This resulted in a number of cases of more or less severe mercurial poisoning with the formation of pseudodiphtheretic membranes

on abraded surfaces in the vagina which soon led to the employment of less poisonous antiseptics and finally to the evelopment of an aseptic as distinguished from an antiseptic technique.

On December 21, less than three months after the institution of the new regime, Garrigues, in reporting the result of his work, was able to say: "The effect of the treatment has been wonderful. As if by magic all trouble disappeared. Ninety-seven women have been delivered since its introduction, and not only has none of them died, but there has been scarcely any disease among them; only three had any rise of temperature. The pavilions are scarcely recognizable. Where we used to have offensive odors; feverish, prostrated, or despairing patients; overworked nurses and despondent doctors, the air is pure, the patients look well, their temperatures are normal, the nurses are cheerful, and the doctors happy."

Could there be a greater triumph than this? Was ever greater lesson taught more quickly? And Garrigues lived to know we knew the value of his deed; lived to know the place of honor he held in the hearts of his fellows.

He was born in Copenhagen on June 6, 1831, and died at Tryon, North Carolina, on July 7, 1913. He received his first degree, that of Bachelor in Arts, from the Metropolitan College of Copenhagen in 1850, and the degree of Master in Arts in 1863. He graduated in medicine from the University of Copenhagen in 1869, when thirty-eight years old. Six years later he came to America and settled in New York, where he remained until his retirement from practice.

His first appointment in New York was as gynecologist to the German Dispensary in 1879. In 1881 he was made obstetric surgeon to the New York Maternity Hospital; in 1885 gynecologist to the German Hospital; in 1886 professor of obstetrics at the New York Post-graduate Medical School and Hospital. In 1901 he was made an honorary fellow of this Society and in 1902 an honorary fellow of the Obstetrical Society of Edinburgh. He was a voluminous writer in the journals, and besides was the author of several books, of which the best known are his text-books on the *Diseases of Women* and on *Obstetrics*, both of which went through several editions.

Dr. Garrigues was a man of simple habits and one who had in large measure those qualities of truth and simplicity which, while seldom leading to great material success, give to their

fortunate possessor the power to look life in the eyes with clear, unswerving gaze and to accept calmly whatever of pleasure or of pain may fall to him. Now after a long and honored life he lies beneath the grass in the shade of the hills about the little town of Tryon, and above him the marble bears witness to the fact that "On October 1, 1883, he introduced antiseptic obstetrics in America."

DISCUSSION

Dr. George Tucker Harrison.—Dr. Wells omitted one point with reference to the appointments of Dr. Garrigues. He was obstetrician to the New York Infant Asylum and I was his colleague. I owe it to him that I was appointed there. He came to see me and asked me if I would like to take the appointment, and I told him I would with pleasure. He liked my methods of study, he was kind enough to say, so I was appointed, and I was his colleague there for some time.

I appreciate the splendid work Dr. Garrigues did, and it is a source of great comfort to me to know that Dr. Wells has in this excellent address put on record the many virtues of Dr. Garrigues, his lofty attainments, and his valuable contributions to asepsis and antisepsis. I cannot speak in too high terms of the man and his work, and with all of it there was so much simplicity, kindness of heart, and devotion to the interests of the profession that he adorned.

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